

# ANUMUKTI

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## *Koodankulam Reactors : - A Bad Bargain !*

Megaprojects never die. Neither do they, like old soldiers, just fade away. But sometimes like an incurable cancer, they have periods of remission. With luck, these periods of remission can last for years. But then the inevitable follows and the prognosis is not good.

Nuclear reactors at Koodankulam are a case in point. They have been in the news for donkey's years. Even during Breznev's time there was talk galore. A memorandum of understanding was signed and the site surveyed for transport of heavy equipment as early as 1988. That was the time when the people had a lucky break. Soviet Union, which was to supply the two thousand Megawatt reactors, collapsed due to its own internal contradictions of being a closed and autocratic system. The nuclear disaster in a newly built Soviet reactor at Chernobyl in 1986 and attempt by the Soviet leadership to suppress information about the catastrophe, also contributed. However, this time people have not been *so* lucky. If only the cardiac arrest of Deve Gowda government had come a few weeks early,

people of Koodankulam and the rest of India would have been spared this assault for some more time. Now, there is no alternative but struggle.

Regular readers of Anumukti are well aware that no kind of nuclear power plant is safe enough or clean enough or cheap enough for any society in the world. However, in the following, for the sake of discussion, let us grant that India is in such a dire need of electric power (a very dubious thesis in the first place) that there is no alternative but to have nuclear reactors at Koodankulam. Even granting these absurd propositions, these reactors are a bad bargain by any reckoning.

First of all for the next twenty years at least they will intensify the power crisis. Studies have conclusively shown that nuclear power plants, if run very efficiently are net producers of energy only in the last few years of their existence. Indian nuclear power plants, which histori-

cally have run at 41 per cent of their rated capacity, are never going to be net producers of energy. Thus undertaking to build a nuclear power plant is the surest way of deepening a power shortage into an immediate crisis.

Secondly, these proposed reactors are the wrong size. A study done in the US regarding the optimum size of a power station with respect to the grid size showed that for a 57,000 Megawatt grid, the best size of the plant was 100 to 150 Megawatts. Having a huge sized plant in a mid-sized grid is the surest way of ensuring that the supply is going to be even more unreliable than at present. The unreliability of the present supply, means an additional 15 percent loss of electricity as people (who can pay for it) try to ensure reliability through use of inverters and batteries. And industry and small businesses try to exploit the kerosene—diesel subsidy by going in for diesel based generating sets.

Thirdly, Koodankulam is a bad site. It is located in the extreme south of

## *A Fate Worse than Chernobyl?*

The diktat of the producers over the consumers was later identified by glasnost as the main weakness of the Soviet economy. Lest we forget in Koodankulam, we are the consumers.

Soviet industry was incapable of building large pressure vessels required for the VVER (the type proposed for Koodankulam). That is why priority was given to the RBMK (the Chernobyl type) design. To provide an industrial base for VVER systems, Atomash was established to manufacture pressure vessels and other components.

Atomash was a key project in the Soviet energy programme. Due to political considerations (the region's party secretary was a close friend of Breznev), it was decided to locate the plant in Rostov region. Planners and builders were in such a hurry to build that they had omitted to make a proper geological survey of the site. It turned out to be unsuitable for the plant and the new town of Volgodonsk. They were built below a hydroelectric dam across the river Don. The chernozem soil was a poor protection against the pressure of the water mass above the level of the site. The area around the town gradually became a swamp. This was a fairly common problem with Soviet hydroelectric projects. (Tawa dam engineers- you are not alone!) By the time the project was nearing completion, Volgodonsk was already a town of 100,000 people. So the problem was simply covered up.

In 1983, sinking foundations caused one of the plant's huge walls to collapse suddenly.

From Zhores Medvedev's *The Legacy of Chernobyl*

*It is on the assumed competence of people with such an outstanding past record that we are willing to put not only ourselves but more so, our neighbours in Sri Lanka in jeopardy. - Editor.*

the country in a drought prone region. Water used for cooling the reactors (and huge amounts are required) is to be taken from a dam which was meant for irrigation in this water scarce area. The farmers of the region were already up in arms against this hijacking in 1988.

Nuclear power plants by their very nature need large steady customers for their power. There are none such anywhere in the vicinity, thus the power produced here would need transportation over large distances to consuming centres thus contributing to the already huge transmission and distribution losses.

There are also international ramifications of siting the reactors at Koodankulam. The Sri Lanka coast is just 20 kilometres away, and the decision is bound to create an additional source of friction in a relationship which shows signs of some improvement after being many years in the doldrums.

Fourthly, the reactors are the wrong design and have many safety associated problems. Indian nuclearists will no doubt point to the fact that they are not the Chernobyl kind. But it is a fact that before the disaster at Chernobyl, Soviet nuclearists were convinced

that the Chernobyl design was in fact safer and better than the presently proposed VVER kind. (See Box) These have a narrow pressure vessel, with the result that the fuel elements lie much closer to the surface of the vessel. Constant impinging of high speed neutrons causes the vessel to become brittle with time and this could lead to catastrophic failure.

Having a large number of different reactor systems in India is in itself a safety hazard. Personnel have to be trained in handling these different systems and they are then of not much use in handling problems in other reactors. For a small nuclear programme like in India this diversification introduces additional unnecessary vulnerabilities.

But all these points are mere academic quibbling. In reality, nuclear power plants are a dead technology. And costly to boot! In countries which allow the markets to decide the choice of technology, nuclear power is well on the way to joining the dodo. In USA, many even very efficiently run plants are finding it increasingly difficult to survive in an open and deregulated market. Every month brings news of some group of utility executives deciding to shut down an

operating nuclear plant and dash for gas and cogeneration. It is only in countries where bureaucrats and politicians have an incurable habit of squandering public money, that nuclear power gets considered.

If India wants to play Santa Clause to our poor cousins the Russians, let us by all means gift them two billion dollars. But why should we saddle ourselves with a non performing and dangerous poison producing plant in exchange?

Surendra Gadekar

### ***Anumukti Family News:***

By this time you may have received the Chernobyl Special Issue. As promised, the Aug./Sept 1996 issue is in your hands. We have not heard from most of you for over a year. The postcard price is still 15 paise, so do drop us a line confirming your correct address and communicate to us your interests and comments.

We are in the process of upgrading our address lists and we find that many of you are yet to renew your subscriptions.

Anumukti Team  
30/4/97

# *The Selge of Gorleben*

**T**he facts and figures are self-evident and telling. It took the largest security operation in postwar German history—the mobilization of 30,000 police—to move six radioactive waste transport canisters a few hundred miles from southern Germany to the northern farm town of Gorleben.

There, the casks are placed in "interim storage, inside a building that from the outside looks like nothing so much as a soft drink bottling warehouse.

Along the way to the small city of Dannenberg, the casks faced rail saboteurs, people blockades, and two people who cemented themselves to the tracks (the police couldn't remove them, and eventually removed and replaced the tracks instead).

At Dannenberg, the casks were lifted by a huge crane from the rail cars to trucks, in preparation for the final 14 miles of road transit into Gorleben. When the casks finally reached their destination 36 hours later, the costs were just beginning to be tallied.

More than 150 demonstrators and 20 police were injured. Some 500 people were arrested. At least 20,000 protestors were involved in the final stages, although the number across the country was probably far higher. The transport cost Germany, according to newspaper accounts, \$100 million, not to mention the support of the police union, which has called for no more waste shipments.

And northern Germany, in an area known as Wendland, had become a war zone.

**ANUMUKTI SALUTES  
THE PEOPLE OF  
WENDLAND**

## **WHAT PRICE THE ATOMIC STATE?**

**SIX CASKS**

**173 INJURED**

**300 ARRESTED**

**20,000 PROTESTORS**

**30,000 POLICE**

**ONE HUNDRED MILLION**

The facts and figures are easy: it is the atmosphere, the sounds, the feelings, the experience, that is much harder to describe...

*Wednesday, March 5. morning  
No Roads, No Waste*

Mona, a German student and activist, and I walk to a small farming village about 2 miles from Dannenberg. The CASTOR (Cask for Storage and Transport of Radioactive Material) casks have not yet begun moving, but they will soon—but not on this, the preferred road.

In the center of the village, about 80 tractors are parked together—some are chained together—in a barricade passable only by brute force.

A mile down the road, there are more barricades, made up of downed trees, dirt, concrete, and whatever local people could find. Underneath the barricades, the road has been completely dug out—just a few inches of road and then holes several feet deep. If the 100-ton CASTOR casks are to move down this road, it will collapse. No, the CASTOR casks will not be using this road today, indeed, no one will be using this road for weeks, perhaps months to come.

Above us, police helicopters circle constantly, the noise of their blades is so common by now that it is just background. Over a public address system set up in a car parked in a farmer's front yard, there is an announcement. Mona translates for me: the helicopters may be landing, don't panic.

But a few farmers do panic, and suddenly tractors are moving everywhere. There is far more danger from the chaotic tractor movements than from anything else we have so far seen.

The helicopters land, and 40-50 not-equipped German police jump out and run toward the tractor barricade. Before anyone can react, they begin slashing the tires and trashing the lead tractors—the lifeblood of these farmers.

The townspeople quickly regroup and charge the police, who retreat running, perhaps embarrassedly, down a country lane. The helicopters land again in a nearby field, and to taunts and angry gestures, the police climb back in the helicopters and fly away.

The US couldn't have done it better in Vietnam. And the police have made enemies for life of the people who grow their food. And the casks are not even going to move through here, the road is completely impass-

able and has been for days. It is harassment and destruction by the police, pure and simple. Someone yells out in black humor: call the police, someone is damaging our tractors. But, here, a few miles from Gorleben, in the midst of an undeclared war zone, the atomic stale has revealed its true colors: it is a police state,

*Lueneburg. Saturday, March 1*  
*International Problems*

*Demand International Actions*

Lueneburg is a beautiful, peaceful city of 60,000. Untouched by Allied bombing, many of its buildings date to the 14th and 15th centuries, and have been lovingly restored. There is a university, and an activist student union which a couple of years ago decided there needed to be better international contacts among grassroots anti-nuclear activists.

The first conference, held in March 1996, was not well-funded, but nonetheless brought together activists from about a dozen countries. It was considered a success, and this year, with a little more funding in hand, the conference titled simply the 2nd international anti-nuclear conference" brings together about 60-70 activists from 28 countries.

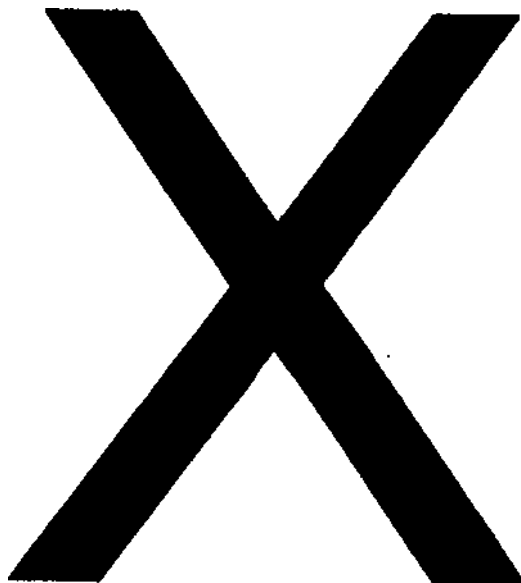
The conference was planned months ago. It wasn't until the last couple of weeks that organizers learned the CASTOR casks would be moving to Gorleben, just 40 miles away, around the same time. The conference goes on, but with a bit of an edge to it.

On the first day of the conference, there is a large rally in Lueneburg. 15,000 people gather in a town square to oppose the radioactive waste transport. Myself and Mario Wan/a from the South African Mineworkers Union, were asked to speak.

The day before, the Bonn government had warned protestors not to disrupt the CASTOR shipments. I tell the crowd that we in the U.S., and indeed, the whole world, will be watching

what happens this week. The crowd needs no German translation, it roars its approval.

On the way to the rally, I did a little quick math. The CASTOR protestors are trying to stop the shipment of specuclear waste casks. I point out that in the U.S., we are facing the possibility of the transport of six casks through Las Vegas every day for 30 years. The crowd boos and yells. And I conclude by saying that this is an international problem and demands international action. The crowd agrees. A few years ago, I didn't think that. Now, it is very clear: our concerns are the same, the companies involved are the same, the solutions are the same. We must knit into a solid international movement if we are to beat the nuclear industry at its own game.



## *Gorleben Will Live*

At the same time as the rally in Lueneburg, 10,000 more protest in Dannenburg. Meanwhile, in Dannenburg, the police attempt to requisition a schoolhouse to serve as a temporary barracks. Too late: the schoolchildren have barricaded themselves inside the building and refuse to allow the police in. But the police move in force, and throw the children out of their school. The Dannenburg officials are unhappy with the police. They refuse to provide them with water or electricity.

*Tuesday, March 4*

## *Every House Says NO!*

We have become an official "observer" team, which mostly means that we can get through police lines. And there are plenty of police lines to get through. Roads are blocked off for miles leading to the Dannenberg/Gorleben area. But the police, mostly from out-of-the-area, don't know the region, and every direction sign has been blacked out by protestors. A few roads, mostly one-lane farm roads, remain passable.

Traveling through the area, one fact quickly becomes clear: the opposition to the waste transport, and to nuclear power generally, is virtually unanimous. The battle has been going on here for 20 years, since the government first announced it would build a reprocessing center at Gorleben, as well as interim and permanent waste dumps, and perhaps a reactor to power it all.

The area was considered to be conservative and not nearly as likely to block the government's plans as the more activist-oriented South. But proposed nuclear projects have a way of turning conservatives into activists. The reprocessing center has long been cancelled, and the resistance to the waste dumps is massive.

The symbol of the movement is an X. Every farmhouse, every townhouse, every household displays an X. Some are quite elaborate, many are yellow, made of wood. Some are glass, some are metal. Almost every house also has anti-CASTOR posters in its windows; many have anti-nuclear banners as well.

The War Zone demarcations become clear: police convoys barrel down two-lane farming roads while the residents promote active resistance.

Near the town of Gußborn, we have to stop. A mud and tree barricade straddles the entire road. Behind it, in the center of the road, is a 15-foot tall

X. made of steel girders, welded and cemented into the road. This baby animating.

100 yards further on begin the serious barricades, one after another, about 20 in all. In between them, the road has been hollowed out from underneath. There is nothing but air. In some places, the protestors have put in logs to hold up the road so they won't cave in on the people digging (hem out. A 100-ton nuclear waste cask cannot possibly go over these roads in the near future; indeed, no vehicle can. The CASTOR will have to go on the less-preferred, twisting route through several towns, or it cannot go at all.

Through side roads and police checkpoints, we eventually make our way to Dannenberg, where the casks sit on trucks awaiting movement. It is about 6 pm. the casks cannot move at night, so they won't move soon.

On the lane leading to the road from the crane, hundreds of people are lying in two-foot tall mounds of straw. They are the front lines: to reach the road, the police must move them first.

But for now, all is peaceful. Music is in the air, drummers play, people cheer. The police throw candy to the people in the straw

The casks are remarkably unprotected. Only a few police nervously walk up and down a very small fenced-off area I walk to within about 12-15 feet of the six casks, radiation detector in hand. Within a minute, the detector has risen to more than 600 counts per minute, then more than 700—about 50 times background radiation levels. The radiation levels decline rapidly with distance though, at 50 yards, it is only five times above background, at 100 yards, there is no discernible radiation increase. Later, I learn that a Greenpeace scientist got a bit closer to the casks, and measured

levels around 4,000 counts per minute—even above the levels near Chernobyl.

The thing is, in Germany houses are built right on the street, with just a narrow sidewalk in between. These giant casks, tomorrow, will travel on narrow roads within just a few feet of bedroom windows and children's playgrounds.

But tonight the air is almost festive: one can almost forget about the sounds of the helicopters circling overhead. We walk from the crane to the largest camp—there are many camps spread



out across the 14-mile route. Each camp plans something different for the final transport.

Along the road, people walk up and down, milling around. There are bratwurst, soda and t-shirt vendors, it has the aura, if not the music, of an impromptu Woodstock. But as the night wears on, temperatures drop precipitously. Thousands of people are now in the straw area between the crane and the road, thousands more block the only road left. We have to leave, and after an hour's drive and an endless meeting, agree to be back to the area in six hours. Time for just a little sleep.

Wednesday, March 5

*Water Cannons and Hacking*

*Dogs*

By 9 AM the removal of the people in the road is well underway. We're quickly updated about 1 AM. The police began moving and arresting people. After three hours, they had only cleared 150 feet of people, so they turned on their water cannons.

These water cannons are mounted on giant armored, Star Trek-looking green tanks. The cannons are operated by remote control from inside the bullet-proof protected cabs. Their power is quite strong, but the protestors have come prepared, and are covered with plastic. As long as they don't receive a direct hit, it doesn't hurt too much and they don't even get too wet.

The police train the cannons on a small group, to break down their assistance, then move in to move and/or arrest them one-by-one. But there are 9,000 people in the way now, so arrests become impossible.

Susan Lee, camera in hand, gets picked up by her hair and thrown across the road. Krista, an activist now working in the Czech Republic against the Temelín reactors, gets clubbed. Others get off easier. Still, tension is building.

During the night, a group of Autonomen — radicals perhaps not organized enough to be anarchists — engage in serious street fighting near the town of Quickborn along the only road the CASTOR can now travel. That road has not been torn up, and the radicals want time to set up barricades and dig under the road.

The police are not inclined to provide that. Tunc Rocks and slingshots are used, and molotov cocktails. According to one report, a woman is critically injured. Many are hurt and/or arrested. The barricades and digging don't take place. The CASTORS eventually will move.



Back in Dannenberg, we watch the water cannons pelt the people in the street. The police arc clearing about one yard of street per minute now.

Above the road, four people have tied themselves into the trees, with a giant banner. The police try to shoot them down with water cannons, but it doesn't work. The CASTORS cannot legally move underneath them, so a team of police goes up and tries to cut them down. This takes at least a half-hour, to the boos of thousands.

The understanding was that the protest would be non-violent. People would block the street, but once moved would not try to reclaim it. They want to show that the violence is caused by the police. The police use their water cannons, billy clubs and shields; here, the protestors simply join arms in resistance until they are moved off the road.

Finally the road is cleared, and thousands of police stand shoulder-to-shoulder to protect the casks. As the casks move out, we are cheered by reports that there are 2,000 more people sitting in the road at Quickborn, and 5,000 more chained across the road, at Gorleben

Nearby, there are various small confrontations between protestors and police, nervous, the police bring out dogs. The barking reaches an ear-splitting crescendo, but there is no serious trouble.

#### *Thursday, March 5, Braunschweig Chernobyl is Everywhere*

That night, Ilya Popov of the Socio-Geological Union in Moscow and I speak to a gathering of people from the area, about our experiences in our own countries. Then, one-by-one, other members of our international delegation speak.

The First Nation Canadians speak in moving terms about what uranium mining has done to their communities. Ottis, in exile from Papua New Guinea for the past 20 years, brings tears with

his tale of repression and death squads. From the Phillipines, Korea, Turkey, from across the world, activists tell their stories; they unload their fears and reveal their hopes. In front of these young German activists, the emotions of the past few days pour out.

The stories are similar: we truly are in the same movement, but it has taken us longer to understand that than it has Westinghouse, or GE, or ABB, or Siemens or the other multinational nuclear corporations which buy and sell politicians like pork-belly commodities.

We each have our local and national battles and concerns, but tonight we truly have become an international movement, understanding each other, and united. It's a feeling unsaid, but shared, and one we hope will stay with us.

*Sunday, March 9, Washington DC  
The Sunset of the Atomic State*  
Back in the USA, having dealt with lost passport and plane ticket—the less said the better...

Most countries, including the U.S., are not yet attempting to move radioactive waste across their nations. Thus, the Siege of Gorleben is hardly an end. It is just a beginning. The first CASTOR shipment into Gorleben took place less than 18 months ago; it brought out about 2,000 protestors and cost the German government about \$15 million. The second shipment cost more than \$40 million, with 9,000 protestors and more than 15,000 police.

Crowd estimates are notoriously unreliable even in a small area, over a 14 mile road, they are impossible. But there were at least 20,000 protestors, and admittedly 30,000 police to usher the new casks into Gorleben

So it has cost Germany more than \$150 million to move eight casks—and the original plans call for the shipment of 412 more casks to the Gorleben "interim" site.

Where does it stop? At what point does the German government, or any government, say 'this is it, we can't do it anymore.'

In Germany, even the police are rebelling. At Lueneberg, and again at the gates of Dannenberg, the "Critical Police" appeared—police refusing to take part in the quashing of the demonstrations; refusing to walk for hours next to the highly-radioactive CASTOR casks. Indeed, the police have called for an end to the shipments.

Without the police state on its side, how can the nuclear industry expect to take its lethal garbage anywhere?

The CASTOR casks only traveled about 300 miles. In the U.S., if radioactive waste transportation begins, many casks could travel nearly 3,000 miles. Eventually, we all will have to make our stand, and it may be sooner rather than later. Most politicians in the US want radioactive waste transportation to begin, because they are beholden to the nuclear industry.

The transportation of radioactive waste is not just a routine industrial maneuver. It is a defining moment. It is our opportunity to expose the nuclear age, and to assert its end.

No government can withstand the costs of Gorleben for long. No government can long withstand the divisions among its people, the alienation of its farmers, the devastation of a War Zone inside its borders.

There is but one obvious path, one poorly-understood by the Governments, but well and truly grasped by the farmers of Gorleben: we must stop making lethal poisons simply in order to generate electricity: our lives, our nations, our futures are all too important for that.

*Michael Marriot  
The Nuclear Monitor  
March 17, 1997*



# Democracy Zindabad!

**S**weden gets around 43 per cent of its electricity from nuclear power. On March 19, 1980, the Swedes held a referendum on whether to continue down the nuclear path. The result was a victory for a scenario for a phase-out of nuclear energy by 2010. The nuclear industry invested 20 million SwK (6 million 1980 US\$) in the referendum but got only 18.7 per cent of the votes. The antinuclear line (rapid phase-out) received 38.6 per cent, but the Social Democrat line (long-term phase-out scenario) got 39.8 per cent. Long term phase-out meant that business could continue to proceed as usual and big businessmen and politicians felt that in time people would get "educated" on the benefits of this wonderful source of power.

Unfortunately, for these power brokers, things haven't worked according to plan. The accident at Chernobyl in 1986, severely affected parts of Sweden's forest land and especially the reindeer herding Lapp community. That put paid to any hopes that the referendum result could be overturned in the future.

But despite the people's verdict, not much action had taken till now as politicians bickered amongst themselves and felt that there was no "viable" alternative to replacing half the country's electricity supply.

However, with time running out, there has suddenly been some movement in the right direction. The nuclear power plant at Barsebaeck, located in South Sweden and only 20 kilometres away from the Danish capital Copenhagen, will be turned off. The first of its two 600MW reactors will be stopped before July 1998, the second before July 2001. This decision was arrived at a midnight meeting on February 4, 1997 in Stockholm between

Social Democrats, Centre party and the Left wing party. The parties have a majority in the Swedish parliament. The agreement came after months of intrigue and is a major victory for the antinuclear Centre Party. The ruling Social Democrats were prepared to wait until early in 2000 to begin decommissioning on 1998 as deadline. This victory of the Centrists is likely to change the face of Swedish politics since till now the Centrists have usually been part of a block in opposition to the governing Social Democrats. The news was a special treat for the Danish population who celebrated with relief. They had been opposing the plant for well over twenty years.

However, the fight is by no means over as yet. Sydkraft, owner of both Barsebaeck reactors, says it would seek compensation for loss of electricity production. According to VEBA, the German energy conglomerate which owns 27 per cent share in Sydkraft via its 100-per cent subsidiary Preussenelektra AG, is satisfied that the whole affair is a bag of wind—and are betting that despite the decision the reactors would not be prematurely closed. After the announcement of the decision, Sydkraft's shares rose sharply as investors perceived that it would not have to bear liability for the decommissioning of these old reactors.

The negotiating politicians agreed that reactor owners should be liable for all costs in the event of an accident, instead of the government stepping in to cover costs above a certain low ceiling. Currently, reactor owners are liable for a maximum of 1.2 billion Kroner (US \$ 17 million) in third party damages per accident. The idea behind the proposed change is to make it economically infeasible to run the older

reactors—for whom accident risks are presumably higher and thus force the utilities themselves to decide to close the units, rather than the government specifying which unit should be shut first.

Big business showed its contempt for democratic values explicitly. Beril-Olof Svanholm, who is chairman of Volvo AB and head of the Federation of Swedish Industries has said that any decision to close Barsebaeck will be fought, and we will never accept that the country unnecessarily throws away SwK 20 to 30 billion (US\$ 2.7 to 4.05 billion) while we chop wood to meet our energy needs.

## *Meanwhile in Japan*

Over half of all Japanese citizens have lost confidence in their governments' statements concerning the safety of nuclear power, according to the latest survey conducted by the Research Council for Energy and Information Technology in October last year. The figures which showed that 57% of people surveyed had little or no confidence in government statements on nuclear energy, comprise the lowest vote of confidence since the surveys began (*The Aikket Weekly*, 1 March 1997).

A petition to permanently close down the Monju fast breeder reactor which suffered a serious accident from a liquid sodium leak and resultant fire gathered over a million signatures. On May 14, 1996 Science and Technology White Paper, a publication that usually gives an overview of the general research scene specifically scolded Monju's owner, the Power Reactor and Nuclear Fuel Development Corporation for its inappropriate post-accident behaviour.

*Nucleomax Week May 16 1996,*



# *Upsurge of Revisionism Regarding French Nuclear Success*

*France is the model nuclear "success" story. A country which following the Arab oil shock of 1973, decided to go in for nuclear and went with vengeance. The nuclear establishment was given a free hand and it "delivered". But hindsight as they say is 20-20. It does offer a better perspective. Energy experts, the courts and the research community are now finding that may be this headlong rush into nuclear wasn't such a bright idea after all.*

## *Et Tu IEA!*

It is time for reorientation of French energy policy, the OECD International Energy Agency (IEA) said in a new review.

In the view of the experts who authored 'Energy Policies of IEA Countries: France, 1996 Review, French energy policy "has reached a watershed" and needs deep reform if the country is to meet IEA policy goals associated with open markets, energy efficiency, and fair competition among fuels. In essence, experts say. France's emphasis on nuclear power has led to a lopsided, inflexible supply structure in which electricity use is excessively promoted, creating severe interfile! price distortions.

Further, they say, the concentration of 90% of government research funding, 80% of commissariat à l'Energie Atomique expenditures, and 50% of Electricite de France's (EDF) research budget on nuclear has starved other sectors for research and development funds and pulled qualified people away from other areas of scientific research, including energy conservation and renewables.

The IEA reviews on France, the second the agency has done since France joined in 1992, was led by Hans Schmid, deputy director of Switzerland's Federal Energy Office. Susan Harrison, of the Electricity Division of the UK's Department of Trade & Industry, was co-rapporteur.

The team had members from Norway, the OECD Nuclear Energy Agency, and the IEA secretariat.

In looking specifically at France's nuclear program, the IEA experts observe that "decision on its development have been taken centrally, with little or no public participation or involvement of the parliament." They say this situation probably cannot continue if France is to renew its nuclear installation in the future, and recommend steps towards greater openness and public participation in energy decision making.

The review also warns that the "inflexible and the rigid power production system" resulting from nuclear plant overbuilding "may be exacerbated by the addition of four reactors currently under construction." The experts note that choice of future generating technology will "in principle be decided by Market" and that nuclear will have to compete alongside non-nuclear options "even for baseload capacity"

The IEA team also recommends that France "finally decided on the future role of Superphenix as an experimental facility, taking into account the age and technical characteristics of the reactor and related investment and operating costs."

*Source: Nucleonics Week*

## *Come Hell or High Irregularities*

As it is nuclear power is usually the most expensive option. But fast breeders take the cake. The electricity they produce is more than twice as expensive as that produced by other (non-breeding) nuclear plants. The French for militaristic reasons went in with a great deal of nationalist fervour in launching Superphenix—the only commercial sized breeder in the world. Breeder reactors produce more plutonium than they consume uranium and thus can theoretically produce large amounts of electricity from very limited supplies of raw material. However, ever since its launch in 1986, Superphenix has been plagued with problems. It never even managed to run consecutively for six months together. It spent most of its time in a state so familiar to reactors in India—shutdown. French regulations require relicensing of power plants which have remained in a shutdown state for more than two years. In 1994, the French atomic energy establishment finally gave up the ghost of breeding. However, with billions already down the drain, they were loath to take the sensible option and let it all go and decommission the plant. Superphenix was resurrected as a non-breeder for research and demonstration purposes. Recently, France's supreme court has annulled the operating licence for Superphenix on the grounds that the licensing decree issued in 1994 assigned the reactor with a 'new' pur-

pose - research and demonstration - not covered in the 1992 restart application and dossier submitted for public inquiry by operator NERSA. The 1240 MWe reactor is currently offline. The French government has re-emphasised its commitment to keep the reactor operating, and is considering either holding a new licensing process to support the 1994 decree, or issuing a new decree more in line with the 1992 documents, which emphasise the reactor's use for electricity generation  
Sources: Nucleonics Week

## We De Have An Address!

*In fact, we have two. A regular postal address and an email address for the other set. Although the cost of writing even a post card has gave up considerably, a letter does feel nice. So do let us know if you like what is in your hands and even more if you don't like it. But most of all definitely let us know in no uncertain terms if you don't receive your regular copy every two months. It is usually our fault.*

## LEUKAEMIA AROUND LA HAGUE NUCLEAR FACILITY

French Environment minister Corinne Lepage and Secretary of State for Health Herve Gymard announced January 10, 1997 that they will commission a thorough epidemiological study of cancers around the La Hague reprocessing plant in Normandy. Their decision followed publication in the latest issue of the British Medical Journal (BMJ) of data claiming that children who played on beaches near La Hague at least once a month exhibited almost a three fold increased risk of developing leukaemia.

Eating local fish and shellfish at least once week was tied to a similar increased risk, according to the study by Jean-Francois Veil, a professor of biostatistics and epidemiology, and Dominic Pobel, a research epidemiologist, at Besancon University's Faculty of Medicine, France.

The two French scientists claimed 'convincing evidence' of a causal role played by exposure to environmental radiation at the seaside, but found no association with parental occupational radiation exposure. They recom-

mended that researchers look for new environmental radiation pathways, particularly in the marine ecosystems

They had originally set up their study to investigate any association between La Hague and local cases of childhood leukaemia. In a previous study, Viel had been unable to establish any clear statistical link

The scientists' methodology came under immediate criticism in the influential newspaper, Le Monde, by Jacqueline Clavel, an epidemiologist with France's National Institute for Health & Medical Research (Inserm), which co-financed the Viel work.

Inserm's name has been linked by the French media to the newly announced study, but neither Inserm nor government ministries would confirm that the organisation had been chosen to conduct the project. Details are expected to be announced in early February.

La Hague encompasses several facilities. Adjacent to La Hague reprocessing complex is a site now operated by national waste agency ANDRA, the centre de stockage de La Manche,

which began receiving radioactive waste (all except highly active waste) in 1967 and was closed permanently in 1994. Both sites have been long under attack from environmentalists who allege pollution of the environs. The Andra site has been shown in an Institute de Protection et de Surete Nucleaire (IPSN) study to have been leaking radionuclides, notably tritium, into two small rivers which cross it, one of which flows to sea.

In addition, a nuclear power station is situated some 16 kilometres away, while the navy dockyards, where submarine nuclear fuel is handled, are 19 km away. Both these facilities are well within the 15-km radius of La Hague set by the study.

Clavel faulted Viel's mode of recruiting control group witnesses via medical general practitioners and questioned the "quality" of this group. But 'the main question,' she said, is that of the applicability of the case study group to the problem raised: whether the leukaemia cases were linked to the radioactive discharges.

She said the study didn't say how far from the sea the ill children or the control group lived, and didn't name the beaches. The doctors should have tried to estimate the doses that could have led to the effects observed, she said.

Catherine Hill, another Inserm researcher, suggested that the method used to recreate activities—interviewing parents of children with leukaemia—was "dangerous" because not every one can remember how often he or she went to the beach 20 years ago, for example, nor know for sure the origin of shellfish eaten.

Viel told *Nucleonics Week* that it was "absolutely wrong" for outside observers to suggest that the leukaemia subjects were living closer to the sea than the controls, thereby being more prone to play on the beach and eat seafood more often.

The cases of leukaemia diagnosed between 1978 and 1993 in people under 25 and the 192 controls were matched for sex, age, place of birth, and residents at the time of diagnosis, he said.

Matched residence meant that they were living within the same electoral ward, he said because of the criticism by such experts as Clavel, he is preparing map markings of the individual dwellings to prove no geographic bias exists, he said, "I'm totally sure that we won't find anything of significance," he insisted, adding that he expects to present the results in a future issue of the *BMJ*.

As for quality of controls, a glance through the tables should be enough to confirm very little difference between both sets of parental social classes, he said.

Veil said the strong link between leukaemia occurrences and the sea had taken the researchers by surprise. The more frequently a child visited the beach or ate seafood, the higher the risk the child faced of contracting leukaemia, he said. Such a dose/response relationship could not be put down to chance alone.

His and Pobel's research also does not stand in isolation, he said. The same marine phenomenon had been

shown to be present near the Dounreay reprocessing plant in northern Scotland, he said in a study by James Urquhart of the Scottish Health Service published in 1991.

Viel said criticism such as not naming beaches were obviously easily made by others after the study's completion, "I was absolutely not expecting such a result regarding the use of the beaches to be so significant,"\* he said. The researchers had therefore not compiled a detailed breakdown of beaches visited by the children. "On the other hand, I have been criticised because I have already used 173 different items. So there are two opposing criticisms I have to face."

As for Hill's concern about possible bias in recalling past recreational activities, Veil said he thought it unlikely to be a factor as both case and control mothers had not been aware of the significance of beach usage until after the data had been compiled and conclusions drawn.

*Source: Nucleonics Week*

## *Reclaiming Community Accountability*

**A**s a result of an open-records program initiated by the United States Department of Energy (DOE) Secretary Hazel O'Leary, information is being made available for the first time which is useful in calculating the radiation and hazardous chemical exposures of worker populations and ordinary citizens in communities which are home to nuclear weapons plants and related facilities. Until now, few have recognised the national scope of health effects studies which are likely to become more significant over time.

A virtual constellation of federal health agencies are now conducting "dose reconstruction" and parallel health effects studies at Hanford, Idaho Falls, Fernald, and Savannah River. Other sites will soon follow. The agencies include the Centre for Disease Control (CDC), National Institute for Occupational Safety and Health (NIOSH), and the Agency for Toxic Substances and Disease Registry (ATSDR). While the Department of Energy's open-records program has made these studies possible, the work by federal health agencies has befuddled citizens' groups now isolated from each other by geographic dis-

tances and a lack of understanding that a national health research program has grown up in their midst without anyone realising it. Workers and citizens who encounter researchers from the federal agencies have asked four common questions:

1. Are we exposed?
2. Are we affected?
3. Did exposure contribute to or cause disease?
4. If we are not affected now, will we suffer later?

It may be difficult for citizens to get answers. The scientific work being done by these agencies to document and calculate exposures to radiation and hazardous chemicals is fraught with uncertainty, politics, organisational confusion, and doubt that anything more than "inconclusive" results will be the outcome of years of effort. The responses of federal health agencies have been inconsistent, and in some cases, downright hostile, in terms of answering the four questions.

Some of the reasons are lack of funding, weak management, the arrogance of scientific researchers uncomfortable over answering fundamental questions from lay persons, and the bureaucratic agendas that distract the focus of otherwise sympathetic agency managers inward like the gravity field of a black hole.

Perhaps most daunting is the fact that there is no national independent clearinghouse that pulls together information on progress being made or collects and distributes information on lessons learned on the most effective ways citizens can respond to the conduct of health effects studies and federal agencies. Several efforts which deal broadly with environmental health studies have been developed, such as the Science and Environmental Health Network (SEHN). What has not yet happened is for citizens to organise a national response to a national program of health effects studies being conducted at nuclear weapons complex sites. This article suggests a next step for non-governmental organisations.

Citizens with basic interests in the outcome of the health effects studies face several essential challenges:

1. Make sense of the scientific knowledge and methods being used by federal health agencies.
2. Focus on the four questions of concern which are being asked by those still living in communities around the site.

3. Pressure federal health agencies which are not doing their job to get their act together.

### *What Should Be Done?*

1: Convene a national conference of NGOs and citizens is to achieve several objectives. These are:

(a) Understand the current and future scope of federal health studies related to the legacy of the cold war.

(b) Establish a national agenda involving performance and qualitative standards for openness, public participation, and accountability for health effects studies

(c) Mount a lobbying campaign with Congress to embed these requirements in enabling legislation for federal health agencies

(d) Develop oversight mechanisms to ensure that federal health agencies are responsive to their congressional mandate

(e) Obtain resources for and roll out a national communications strategy to alert the news media about the national health effects study program. Develop communications tools, such as the Internet, to alert citizens' groups about lessons learned and more effective ways to interact with federal health agencies

(f) Develop mechanisms for recognising the contributions which can be made by citizens interested in pursuing environmental science. This should include training and technical assistance program for citizen activists on how to collect, analyse and distribute scientific information. Most importantly, citizens need help in recognising the significance of scientific findings, knowing what to look for, and how to critically engage scientific experts in dialogue which would produce shared understanding of the results of health effects studies. Funding will be needed to ensure grassroots participation in the conference and in the implementation of an action agenda, described below

2: Develop a clearinghouse of NGOs and citizens groups to carry out these tasks. This can be a virtual or-

ganisation rather than a physical one. but each NGO must put its oars in the water. The clearinghouse must put up an Internet presence via email. WEB site, etc. and also publish a hardcopy bulletin of news, resources, and action items for a national, co-ordinated response to federal health effects studies at nuclear weapons sites. The clearinghouse must function as an "honest broker" despite the many priorities and agendas of NGOs and grass roots groups.

V Engage federal health agencies in a dialogue to change the behaviour of people as well as their respective organisations. It makes no sense to address policies without the people. Hearts and minds of agency staffs, and their contractors, inevitably follow the leadership of the agency organisations. The mindset and credibility of federal managers must be examined, and changed for the better, if the resulting health effects studies are to be successful in achieving their goals. Citizens can call for "boycotts" of agencies, such as a Virginia group did with ATSDR. but there is no long-term future in death spirals of reciprocal allegations of deception and rancour. Everyone loses.

4 Commit to the long haul. Environmental epidemiological studies are like rocket science. Achieving shared understanding of the scientific methods and citizens' concerns will take years. After all, the horrors of the nuclear weapons complex took more than four decades to come to light. It may take a lifetime to recover.

*Source and Contact Dan Yurman, P.O. Box 1569, Idaho Falls, ID 83403, US e-mail yurman@igc.apc.org Dan Yurman is a member of a citizens advisory committee which advises the Centre for Disease Control, Atlanta US*

## ***Studies Find Gene Mutations Higher in Chernobyl Victims***

*In our last issue (Special issue on Chernobyl) had an article by Dr. Rosalie Bertell on "Nuclear Thinking". It argued that radiation injury issues are actually human rights issues and hence political issues. Solution to such problems can only come through political action. Specifically, radiation injury issues are not technical issues any longer. The following article taken from Nucleonics Week—a trade journal—is a good example of Nuclear Thinking. The radiation community finds radiation related activities so profitable, that it refuses to accept studies which show the effects of radiation to be far more detrimental than postulated by these worthies.*

**A** Russian-Belarusian-British research team has found twice as many genetic mutation in the offspring of parents living on contaminated territories around the Chernobyl plant site than in a control in the UK

The team, which includes Yuri Dubrova and Alec Jeffreys of the University of Leicester, studied 79 families inhabiting heavily polluted rural areas of the Mogilev district of Belarus, about 250 kilometres north of Chernobyl, among which all the children were between February and September 1994, and a control of 105 families in the UK. Using a technique developed by Jeffreys that measures the mutation rate of "mini-satellites"—specific genome site that features an usually high number of repetition—the research team found a statistically significant twofold increase in mutation frequency in the offspring of irradiated parents, "they wrote in April 25, 1996 issue of the British journal *Nature*. The mutation was measured compared to the parents genes,

The scientist said that the mutation rate in the Mogilev families was correlated with the level of caesium-137 surface contamination, thus concluding that the mutations have been induced by radiation. However, they were not correlated with individual doses received by the population

In the same issue of *Nature*, a team from Texas Tech University and the Savannah River Ecology Laboratory, led by Robert Baker of Texas Tech, reported 'high levels of genetic change' in rodents—two species of vole—living next to the Chernobyl plant, in comparison to a control group living in a relatively clean area about 32 kilometres Southeast of site.

The results had not been predicted by existing models of the effects of radiation. In the case of voles, 'the estimated substitution (mutation) rates were at least two orders of magnitude greater than any previously reported for mitochondria protein-coding genes," said David Hills of the Department of Zoology at the University of Texas, Austin in accompanying *Nature* commentary

But observes cautioned against drawing firm conclusions about the eventual impact of the genetic changes on the health or gene pool of either animals or humans in the area. Especially in the case of the study of human gene mutations, they said, it would be necessary to follow up the work by Dubrova et al. to confirm that the mutations indeed correlated with radiation dose and are not caused by other environmental aggressors which were not studied specifically.

The publication of these results on the eve of Chernobyl accident's 10th anniversary was certainly not by-

chance, said one French Scientist, adding, "*Nature* played its cards right." Nothing was said about their work of the two research group in the major multi-agency conference on "Chernobyl: One Decade Later." held in Vienna April 9-12. Working papers from that conference did, however, highlight the genetic change observed in animals and plants close to the reactor site—which were said not to threaten the region's ecosystems—as well as the potential for genetic mutations in humans, probably also not posing a significant threat.

Philip Vision, a geneticist at the French Institute for Nuclear Safety & Protection (IPSN), said that gene mini-satellite were discovered in 1980 and five years later. Jeffreys pioneered their using confirming parental relation between individuals by studying "genetic finger prints". The mini-satellite vary greatly between unrelated individuals, with very slim chances of finding the same pattern, but they are quite stable from parent to child. The length of mini-satellites can be measured by probe, establishing whether they contain the correct number of repetitions or not: in the later case, the researchers say a mutation has occurred

In the study of Mogilev residents, Dubrova et al. found that length changes in nuclear mini-satellite loci were about twice as common in the Belarus children (compared to the par-

ents; loci) than in their UK counterparts. They found good correlation between the highest mutation rate and the areas in the highest median ground contamination. The total mutation rate was 1.5 times higher in more-contaminated areas (over 6.8 curies per square km) than in less-contaminated ones (under 6.8 Ci/km<sup>2</sup>), they said.

However, the research team members acknowledged they had not been able to correlate their findings with individual doses received by the study group—those dose levels "are not known," they wrote. Moreover, although the correlation with surface contamination is consistent with the possibility of Chernobyl-caused mutations, they added, "it is possible that other non-radioactive contaminants from Chernobyl, such as heavy metals, could be responsible for the observed, apparently dose dependent increase in mutation rate."

IPSN's Voisin said it was "a pity" that the scientists had not made a greater effort to find a control group within Belarus, rather than going to a rural area in the UK that would not be expected to have the same spectrum of contaminants, either radioactive or

chemical. Because the role of chemical pollutants had not been taken explicitly into account in the study, he said, the results "are to be considered with caution." even if the study represents "an interesting, advance" in knowledge about the effects of radiation.

Scientists studying radiation health effects have stressed that, although genetic mutation were observed in offspring of survivors of the Hiroshima and Nagasaki atomic bombings, no lasting hereditary were observed. In the case of Chernobyl contamination, that may also prove to be the case, they say.

Indeed, few people realise the size of the background rate of genetic mutations, said Fred Mettler of the radiology department at the University of New Mexico. He told journalist attending the Vienna meeting that about 2% have a serious one. and 1%. a defect that can be fatal

More generally, there is growing recognition in the scientific community that the health-effects lessons of the Hiroshima and Nagasaki bombings may not be applicable to the other radiation accidents. In his Nature coin-

mentary. Hills argued that the fallout from Chernobyl is so different in both diversity and extent from the Japanese fallout that "predictions from one to the other are not likely to be very meaningful. The studies of Chernobyl," he went on, are therefore providing the first glimpses of genetic effects of severe nuclear accidents' - effects he suggested bolt down, at least in the case of the Chernobyl rodents, to the "compression" of millennia of genetic change into a few years

While scientists generally agree that more research is needed on the question, some wonder where the emphasis should be placed. Voisin said that, at the annual meeting of the International Radiological Protection Association immediately following the Vienna Chernobyl-consequences conference. Dan Benmson, former chairman of the International Radiological Protection Commission, publicly raised the question of whether vast new studies of the effects of low-level radiation are really worth the money and effort that they will necessarily entail

*Ann MacIachlam.  
Nucleonics Week May 2 1996*

### **"Not Now Not Ever"**

## ***Thoughts From An Australian Abolitionist***

**I** has been a very exciting year for abolitionists of nuclear weapons. We have seen in succession, the International Court of Justice decision on the illegality of nuclear weapons, the passage of the CTBT, the report of the Canberra Commission, the Malaysian resolution in the UN General Assembly, and statements by top military people in favour of abolition. All this has made it appear as if progress toward the abolition of nuclear weapons is no more than a matter of time. Yet recently, much of the

impetus toward abolition has seemed to wane, at least at official governmental and UN levels. The Malaysian resolution' welcoming the ICJ decision passed the UN General Assembly with the expected comfortable majority, but most of the western nations (including my own, Australia) either voted against it or abstained (India voted in favour.) On the other hand, preliminary negotiations to set up a verification regime for the CTBT have ended in disagreement, progress towards a fissile material production ban

scents to have stopped altogether, and other measures toward abolition recommended by the Canberra Commission (taking weapons away from their delivery mechanisms, and taking nuclear forces off alert as well as further deep reductions in US and Russian weapons levels do not seem to be taking place at any discernible speed

Meanwhile, a number of negatives have appeared on the scene, of which the greatest is probably US plans for subcritical nuclear tests in India.



there are rumblings to the effect that if the US indulges in subcriticals, India may start testing. People I spoke to in Delhi attested to this.

### *The ICJ Decision*

The decision of the International Court of Justice on the legality of the use or threat of nuclear weapons had in effect, three components: (1) The ICJ found no situation in which it could conclude that the use of nuclear weapons in war, or the threat of their use, was legal. (2) The ICJ concluded that the use or threat of nuclear weapons in war is generally illegal because it violates internationally agreed laws of war that have stood since the 1920s. The only caveat that the ICJ made to this was that it was unable to agree that the use of nuclear weapons could be legal in the most extreme circumstance of self-defence. (3) The ICJ concluded unanimously that there exists a legal obligation on the part of the weapons powers to negotiate in good faith and to conclude an agreement to eliminate nuclear weapons. It was this that the 'Malaysian resolution' tried to turn into practical reality later in 1996.

The ICJ decision has potential implications that are very far reaching indeed, but they have yet to be tested in a court of law. For example, it has been argued since the decision in the UK, that the UK's nuclear missile submarine patrols are illegal as they represent a threat of use of nuclear weapons. It is argued that NATO first strike doctrines are illegal, and that changes in US and NATO nuclear doctrine to no first use, argued for in the report of the Canberra Commission, are the only legally correct response to the ICJ decision short of actual elimination of nuclear weapons. It has already been argued successfully by 'For Mother Earth' in a Belgian court in a case of trespass on a NATO weapons bunker, that civil disobedience against nuclear installations is legal because the installations are in fact illegal.

However, the weapons powers, after trying to prevent the resolution under which the question of the legality of the use or threat of use of nuclear weapons was referred to the court in 1995 from being passed, and after alternatively arguing before the court that the court had no jurisdiction and that the use of nuclear weapons was a legitimate use of the right of self-defence under the UN charter, have done their best to ignore or evade the consequences of the ICJ decision. The US, UK, and France, have all argued that since their nuclear weapons are all of a 'defensive' nature, and all make use of the doctrine of deterrence, that the ICJ decision has no consequences whatever for them. It is significant and disturbing, that General Sundarji argues in the May 1996 number of 'AGNI', the journal of the Forum for Strategic and Security Studies that 'The international Court of Justice has recently ruled that the possession of nuclear weapons is not illegal'. True, the ICJ decision does not say that, but the ICJ opinion comes very close to that in saying that use or threat of use is illegal, except under very narrowly defined circumstances where the court can't make up its mind! What General Sundarji (like the major weapons powers) did not acknowledge is that the ICJ came up with an opinion in which no legal use of nuclear weapons is identified, and says so explicitly.

Only Canada so far has suggested that it may have to 'review' its position under the US nuclear umbrella as a result of the ICJ judgement. Time will tell however, whether the ICJ decision will be tested in national courts of law, and whether in particular, doctrines of 'first strike' could be found illegal.

### *The Comprehensive Test Ban Treaty.*

The CTBT has been hailed as the way to universal salvation from nuclear damnation or at least as the first step toward abolition, and damned as a

machiavellian attempt by the weapons powers to hang on to their existing monopoly by preventing others from testing.

India has refused to sign the CTBT 'not now and not ever', claiming quite correctly that it allows the nuclear powers to continue warhead development. However, India's criticisms cover a scarcely-veiled desire to test itself, and my discussions with some influential people in Delhi certainly made it plain that this desire is very real in at least some quarters. The thinking there is that India, if it tested, could well withstand the resulting embargo, and that Pakistani capabilities could safely be ignored. In addition, a need to test if India is to weaponise the device it tested in 1974 is argued.

This may be dangerous nonsense, but some at least do believe it. The Forum for Strategic and Security Studies, a Delhi 'think-tank' argues that had the 1996 session of UNGA failed to pass a resolution in favour of a nuclear weapons convention. India should look to its strategic interests - and test. Whether the Malaysian resolution, which advocated negotiations toward a nuclear weapons convention, is deemed to be sufficient is a good question. The series of subcritical tests planned by the US might be the next 'trip-wire'.

The CTBT is neither exactly salvation nor damnation. Depending however, on what happens after the CTBT, it may become a rather early milestone on the road toward salvation if indeed we are headed in that direction at all.

What the CTBT actually does is simply to prevent explosive nuclear tests in which the quantity of fission energy released exceeds that of any high-explosive charge used to implode the fissile material. In effect, this works out at about 4Kg of TNT. This means that explosive above-ground or underground tests of the kind that recently were undertaken by France at Mururoa atoll and very most recently (on the very eve of the signature of the



CTBT in fact) by China at Lop Nor, are now illegal. Whatever the other flaws of the CTBT, this has to be a plus for abolition.

The CTBT does not contain any commitment to a timed framework' for abolition of nuclear weapons, or for negotiations toward abolition. Nor does the CTBT place any restraint whatsoever on testing other than explosive and 'hydronuclear' testing (where it is ambiguous). The US, technically, is thus quite within its rights to conduct a series of subcritical' tests of zero or near-zero fission yield (whatever that may mean) at the LYNER facility in Nevada.

In fact, subcriticals are the least of what is allowed under the CTBT. A whole range of multibillion dollar facilities now exists in the US. under the Science-Based Stockpile Maintenance' programme, including the Dual Axis Radiographic Hydrodynamic test facility (DAHRT) which takes high-speed 3-d x-ray photos of plutonium and uranium bomb components under explosive deformation, an essential component of weapons design and the high-powered laser facility nominally for use in fusion research, which may also be of use in weapons design. France also has similar laser facilities. The lack of any restraints in the CTBT over testing of this type, has resulted in accusations that the CTBT merely institutionalises the dominance of the existing weapons states.

Besides, the CTBT has an opt-out clause. This allows a state to test simply because for whatever reason it feels it no longer has confidence in some component of its nuclear arsenal

Finally, there is the question of the Entry into Force' (EIF) of the CTBT, which as so much vexed India. The current provision for entry-into-force(EIF). whereby 44 named countries must ratify the treaty before it can actually become fully legally binding was included at the insistence of the

UK and Russia, precisely in order to fatally weaken if not sabotage the treaty. There is thus a great deal of truth in the arguments that the CTBT fails to deliver on a timed framework for the elimination of nuclear weapons, and that it allows to of the kind that the weapons power are best equipped to do.

Other nations besides India, (notably Bangladesh for financial reasons), have indicated reservations about ratifying the treaty. Indeed, while it might be possible to induce Bangladesh to ratify with some form of financial 'sweetener', big questions exist over whether in fact, the US congress, still dominated by the republican right which has explicitly damned the CTBT as contrary to US National interest' will allow ratification and of course whether a paranoid and nationalist Russian Duma will do so

The fact that the CTBT will most likely never enter into force does not wholly rob it of value. It still provides a very strong political barrier to actual explosive testing and to some extent even to subcritical testing Any nation that tested from now on would be faced with international opposition and condemnation (and probably sanctions) that would make the storm over French testing look like one in a very small teacup. In other words, for all its flaws, and there are many, the CTBT does provide a political and to some extent a legal, barrier against testing. The real impact of the CTBTs failure to enter into force lies in the fact that until it does so, the CTBT verification regime will function on a voluntary basis only.

*John Hallam*



## *Last and final call?*

Another All Fools Day and the reactors at Tarapur (Rhymes with Bhago—Dur in Hindi) are a year older. They are already well past their 25 years design lifetime, and Dr. Gopalakrishnan had informed the nation more than a year ago. that they badly need to be inspected. Tor core shroud damage and India does not have the technology to do so. However, our nuclcocrats have blithely continued to operate them while giving Dr Gopalakrishnan the boot. The following story from Japan is another reminder that old reactors don't just fade away

On 26 November 1996. during a regular inspection at Tokyo Electric's Fukushima reactor (BWR. 460MW. 1971). inspectors discovered cracks in the pipe inside the reactor pressure vessel. Having been in operation for years, the cracks are perhaps a manifestation of the reactors age

The cracks appeared near the welds in two neighbouring pipes that earn coolant from the pressure vessel jet pump, and it appears that the direct cause was stress corrosion. In all. five cracks of lengths varying from 2 to 19 cm were discovered in almost identical places on the pipes. very close to the inside wall of the pressure vessel

TEPCO (Tokyo Electric Power Company) has decided to deal with the cracks by simply clamping on steel supports and bolts and not by replacing the pipes. This is. however, obviously a stopgap measure providing no long-term guarantee of safety. The clamped pipes could rupture at any moment.

### *Difficulty of Repairs*

The pipes are located below the area between the nuclear fuel core and the pressure vessel. An area that is very confined and highly radioactive. There are limits to the possibility of repair work by remote controlled robots because of the difficulty of working in such a tight space, and the difficulty

of controlling robots in a high radioactive environment. Thus, the replacement of these pipes will pose not only technical difficulties, but will also entail a lot of work involving heavy radiation exposure to labourers.

If the in-core piping is replaced in Fukushima 1-1, it will be the first time such work has been carried out. meaning the job have to be done without any technical corroboration whatsoever. Since these pipes were not designed or installed under the assumption that they might one day be replaced, the task is likely to be a very difficult one.

Naturally, other reactors with piping made of the same material should be shut down and inspected, but new problems could conceivably crop up, even where corrosion-resistant materials have been used. Nucleocrats must henceforth anticipate such age-related problems in all nuclear power stations.

#### *Replacing entire BWR shroud*

The Nuclear Power Engineering Corporation and Hitachi, Ltd. are developing technologies to enable replacement of in-core structures in boiling water reactors in order to keep ageing reactors on-line. This is part of the "Nuclear Power Plant Maintenance Technology Reliability Demonstration Tests" commissioned by the Agency of Natural Resource and Energy (ANRE). Currently they are running tests on replacing guide tubes for neutron flux measurement instrument. They are planing subsequent tests for replacement of core shrouds, control guide tubes, and jet pump riser braces.

In addition, we have received information that Toshiba has placed an order with a British company for three units of a large remote-controlled machine to be used in the replacement and the installation of shrouds. According to the information source, the replacement work may soon be carried out for a number of older Japanese BWRs.

Replacing a whole shroud- a large in-core cylindrical steel structure surrounding the BWR fuel assemblies- would no doubt be a job of considerable scale.

Replacing PWR steam generators is also a major construction job that entails making a large opening in the reactor containment.

Replacing, a shroud would be an even big because it should be performed inside the pressure vessel. This would require opening the pressure vessel cover, taking out all components including the steam dryer, lattice, and fuel assembly, loosening and extracting the shroud, then inserting the new shroud, and finally performing the welding and other tasks inside the core. Although workers would probably be shielded by lead plates set up around the inside core wall, they would still be exposed to extremely high radiation levels.

#### *Critically*

#### *Ageing Reactors and Their*

#### *Decommissioning*

There are no distinct criteria for the operation of aged reactors or for making decisions on when they should be decommissioned. We therefore have a strange situation in which development of the technology proceeds without consideration of how to handle old facilities.

Assessing the state of nuclear power plants should at the very least be done in a disinterested manner, instead of according to arrangements like the "regular safety reviews" that are internally managed by the utilities themselves.

The problems occurring in aged nuclear power plants are of kind that are hard to discover during regular inspections, or which such inspections are not even meant to find. To properly assess the degree of ageing, there should be a requirement for an overhaul-like inspection in which plant after, for example, 10 or 20 years of operation is shut down for two or three years. It could perhaps be mandatory at that point to declare the plant decommissioned if it cannot satisfy certain criteria, the formulation of which would of course be another problem.

*Source: Nuke Info Tokyo*

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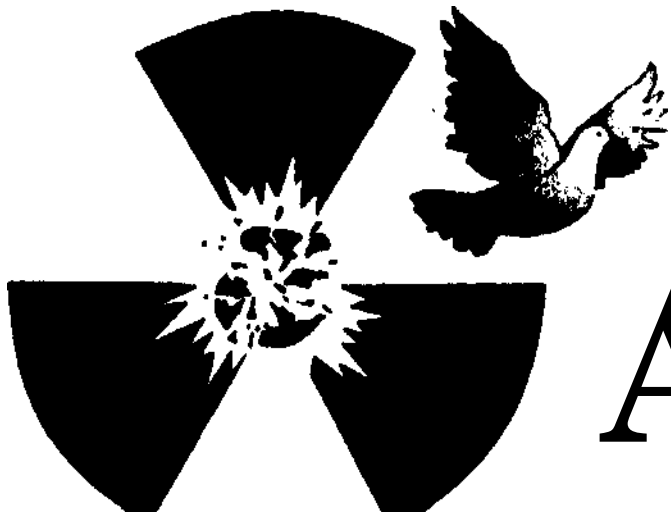
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# ANUMUKTI

A Journal Devoted to Non-Nuclear India

*Anumukti: Volume 10, Number 2*

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## *Shoulders*

*A man crosses the street in rain,  
stepping gently, looking two times north and south,  
because his son is asleep on his shoulder.*

*No car must splash him.  
No car drive too near to hit shadow.*

*This man carries the world's sensitive cargo  
but he's not marked  
Nowhere does his jacked say FRAGILE,  
HANDLE WITH CARE.*

*His car fills up with breathing.  
He hears the hum of a boy's dream  
deep inside him.*

*were not joining to be able  
to live in this world  
if we're not willing to do what he's doing  
with one another.*

*The road will only be wide.  
The rain will never stop falling.*

*Naomi Shihab Nye  
Atomic Ghost: Poets Respond to the Nuclear Age.*

# Indian Courts Need to be Educated on Nuclear Issues

The rejection by a division bench of the Bombay High Court of two writ petitions demanding public information on violation of safety regulations at various nuclear installations again highlights the fact that it is necessary to educate the courts before rushing in with petitions demanding justice.

The petitioners in the present case relied on an interview published in Times of India of former chairman of the Atomic Energy Regulatory Board, A. Gopalakrishnan who had referred to 130 violations in nuclear installations in the country.

The affidavit filed by the authorities, submitted that records of the DAE were privileged communications and were always classified as secret. Additional Solicitor General R A Dada also produced a memorandum constituting a review committee to investigate the present regulatory procedure. He said that the committee will submit its report in four months.

Chief justice M B Shah and Mr. Justice F I Rebello held that as a competent body had already been constituted to look into the matter, the court need not intervene. The petitioners had urged that DAE should disclose the report listing the safety violations.

One of the petitions submitted, "Various reports in the media have highlighted that safety measures at the installations, research facilities and power plants were not up to the mark, resulting in serious defects and accidents that endanger lives of employees, innocent citizens and all life forms." It further urged that citizens had a fundamental right to know about their safety. Counsel for the petitioners M A Rane said the claim to secrecy

## From the Editor's

### Devaluation of Public Morals

There was a time when our leaders were people whose words, though not law, did carry weight. You could believe them. Honesty and probity in public life were considered virtues. Unfortunately, nowadays an honest public servant is a rarity. The very term "public servant" is an anachronism.

The most shocking revelation in recent days have not been the antics of Laloo Yadav but those of Inder Gujaral when he declared that the country possessed a stock of chemical weapons which would now be dismantled in view of our commitments under the chemical weapon's convention. It has been our oft-stated policy that chemical weapons shall be no part of our armoury since they are weapons of mass terror. As the admission by Mr. Gujaral clearly indicates, we have been saying one thing while doing the opposite and clandestinely making and stockpiling these heinous weapons. The fact that other nations (read Pakistan) have been doing the same is no justification for our own indefensible moral lapse.

Not only has the revelation not shocked the press, but it has instead been greeted by relief that Indian leaders despite all their preoccupation with sticking to their seats, do sometimes think about the security of the country! A hope has also been expressed in some sections of the press that similar will be our situation with respect to nuclear weapons and despite all our pronouncements we have been secretly building a stockpile of these as well. Nothing could be more bizarre!

If we want to be a nuclear weapon's power, let us by all means democratically decide to do so, but then do so boldly and openly so that the costs of so doing are well understood by all. To do so clandestinely is the worst of all possible worlds. Firstly, the so called benefits remain hidden. Secondly, the horrendous costs not only in monetary terms but more importantly in people's health also remain hidden. An uncaring elite will just not listen to the people who have to pay the price for these delusions of big power grandeur. The worst consequence of back-room decision making is that the people's cynicism regarding their leaders, gets deepened—a sure recipe for dictatorship.

amounted to denial of the citizen's right to know matters which affected their lives.

This is not the first time that courts in India have given unfavourable verdicts on nuclear issues. The same thing happened in the Chernobyl Irish butter case in 1987. While the Supreme Court's verdict in the Kaiga site selection case was favourable, it did not force the atomic establishment to change its course. Therefore, there is a need that these verdicts be prop-

erly analysed to find out why judges in India are so hesitant to discipline errant nucleocrats. Is it the mystique attached to the bomb and all matters nuclear that has made the judges so diffident? They don't seem to have the same diffidence towards other technical personnel, dam building engineers for example. Education of judges and bar associations on nuclear issues ought to be a high priority for the antinukes in India.

*Based on a report in  
Times of India 2.2. '92*

# *Environmental Racism: A Landmark knoldgement*

*Eight years ago, a group of international nuclear promoters got together and hatched a newscheme. One thing admirable about these guys, they are certainly industrious and persistent. At the time the state of Louisiana in the deep South of USA had a staunch pro-nuclear personality J. Benner Johnson as its senator. Having been in the senate for a long time Johnson had become extremely powerful. He was the head of the Senate energy committee which decided on legislation on energy related topics. The promoters were Eurenco—the European uranium enrichment consortium. Duke Power, Northern States Power Fluor Daniel and to a small extent Louisiana Power and Light. The first thing they did was to form subsidiaries which together floated a company by the name of Louisiana Energy Services with the express purpose of building and operating a uranium enrichment plant at a site in Claiborne Parish near Homer in Northern Louisiana. The main purpose of doing things in this roundabout way was to protect the promoters from any financial liability due to environmental damage caused by the project.*

*The site chosen was very close to two poor black communities. This too is a world wide phenomena. Any facility with health impacts gets built in poor communities who are then told how this wonderful new project is going to make an enormous difference to their benighted lives. All this is true, the project does make a great difference though not in the way it had been previously projected but in an entirely negative manner. Unfortunately for the promoters, this game has been going on for too long. Now a days, the poor instead of being properly grateful for this uncalled for generosity are downright suspicious. They organise and fight. The following is an account of a mulirai lai coalition, Citizens Against Nuclear Trash (CANT) of communities in Homer who got together and beat powerful nuclear interest and in the process have opened a new legal pathway for other similarly placed communities to follow.*

**T**he nearly eight-year struggle against the proposed uranium enrichment plant of the US Louisiana Energy Services (LES) is at an end. Light years of hearings, demonstrations, organising, meetings, and ongoing and unusual solidarity and support among the multiracial members of Citizens Against Nuclear Trash (CANT) in northern Louisiana have paid off.

On May 2 nuclear Regulatory Commissions Atomic Safety and Licensing Board (ASLB) released its final decision on the proposed LES project. The unheard-of verdict; license denied. The ASLB reached its precedent-setting decision on the final, and critical, environmental justice contention. Earlier, the ASLB had ruled in favour of CANT that the LES consortium was not financially qualified to build and operate the plant, and was essentially a shell corporation apparently intended primarily to avoid

potential liability for its parent companies. And the ASLB had ruled that LES had underestimated its likely decommissioning costs by about 50% — enough that it's already dubious profit projections were shaken. But the final decision denies outright LES a construction permit/operating licence. Unless LES can successfully appeal this decision to the NRC commissioners, which appears highly unlikely, it is all over.

LES will become the first entity in the US to which the NRC ever has denied a license, for any reason. CANT and its attorneys, Washington lawyer Diane Curran and Nathalie Walker of the Sierra Club Legal Defense Fund of New Orleans, argued that the LES project was a singular example of environmental racism, and that the NRC had not done its job to ensure that the proposed plant did not have a disproportionate impact on the local poor African-American popula-

tion. Dr. Robert Bullard, a professor at Clark Atlanta University and a nationally recognised expert on environmental justice and facility siting issues, testified on behalf of CANT. Bullard argued that the LES siting process clearly zeroed in on minority communities, eventually targeting a community that is nearly 98% African-American, that the citizens of the Forest Grove and Center Springs communities closest to the plant would suffer a disproportionate and negative impact if the plant were built, and that the LES violated its own site selection criteria in choosing the eventual site, which itself was evidence of environmental racism. The ASLB agreed with all of these contentions.

The ramifications of this decision may be impossible to overstate. This is the first decision, issued by any judicial body in the US, that directly addresses the environmental justice issue, and does so in a framework that





makes clear the responsibilities of corporations and federal agencies. In addition, the decision spells out the responsibilities of federal agencies in complying with President Clinton's 1994 executive order on environmental justice the first such detailing anywhere. By denying the LES a license, the Board underscored its commitment

upcoming court cases. Seemingly aware of the historic nature of the decision, the ASLB stated in unusually clear terms exactly what is required of the NRC, and perhaps all federal agencies in reviewing license applications for hazardous facilities. In doing so, the ASLB also provided a clear, concise explanation of how environmental

siting policy was not racist. The NRC staff would then have to conduct a "thorough investigation" to validate that. But the ASLB made clear that it believes the process was based on racial issues: The "statistical evidence very strongly suggests that racial considerations played a part in the site selection process. It does not, of course, rule out all possibility that race played no part in the selection process. Nonetheless, the Intervenor's (CANT) statistical evidence clearly indicates that the probability of this being the case is unlikely..." It would seem then that the LES's only opportunity would be to start its site selection process anew — a process that could not possibly lead to the proposed site in Claiborne Parish — and would bring the consortium, eight years later and at least US\$40 million poorer, back to square one. The ASLB decision is essential reading for anyone involved in nuclear or hazardous siting issues. It is available at NIRS' web site ([www.nirs.org](http://www.nirs.org)) or by mail from NIRS at the address given below.

Source and contact: NIRS, 1424  
16th Street NW Suite 404,  
Washington DC 20036. USA.  
E-mail [nirsnet@igc.apc.org](mailto:nirsnet@igc.apc.org)

*"Racial discrimination in the facility site selection process cannot be uncovered with only a cursory review of the description of that process appearing in an applicant's environmental report. If it were so easily detected, racial discrimination would not be such a persistent and enduring problem in American society. Racial discrimination is rarely if ever, admitted. Indeed, it is often rationalized under some other seemingly racially neutral guises, making it difficult to ferret out. Moreover, direct evidence of racial discrimination is seldom found....In other words, the Staff must lift some rocks and look under them."*

works, how it is not overt, how it is never admitted, but how it must be ferreted out because that is what the law requires. In their own words, "A thorough investigation must be performed — In other words, the Staff must lift some rocks and look under them"

to environmental justice and laid the groundwork for all future nuclear siting decisions. Every NRC-licensed facility will have to comply with this decision. Moreover, as the first judicial decision on these issues, the opinion undoubtedly will be cited in other

to imagine what options now lie open for LES. The consortium can, of course, appeal the decision. The ASLB denied the license "without prejudice", meaning that the LES can attempt to amend its license application to attempt to prove that its

It is difficult

## *Bulgarians Show More Sense Than Deve Gouda and Gujarat*

*Nuclear energy is a costly and economically unsound proposition. However, nucleocrats with their glib talk and hiding behind an aura of scientific respectability are usually able to sweet talk their scientifically ignorant political masters. The fact that nuclear projects involve billions and can provide large commissions for people with good connections to power, also helps. One of the last acts of Shri Deve Gouda as Prime Minister was to go to Russia with Mr Gujaral in tow and sign the deal for two 1000 Megawatt VVFR type reactors. The reason given for this act of folly and reported in most newspapers was that Russia was willing to provide "generous" terms of credit. It is a pity that none in the Prime Minister's large entourage questioned the motives of their Russian hosts in providing this generosity. For a country which is out with a begging bowl even larger than India's, to be offering credit should cause alarm bells to ring. The new government in Bulgaria has shown a greater sense of responsibility, commissioned a study by independent and honest experts who came to the inescapable conclusion that even with generous Russian credits, nuclear power plants in this day and age are if not anything else, a prescription for economic disaster.*

*"Too Cheap To Meter" had once been the motto on the nuclear flag. New scholarship (see Arjun Makhijani's report "The Nuclear Power Deception") has shown that while nucleocrats were shouting this mantra from rooftops their own studies were showing unequivocally that nuclear power was*



likely to be extremely costly. But helped by massive government subsidy nuclear power was able to capture market share in some countries. But, the inherently costly nature of nuclear power was slowly discovered all over the world despite the subsidies and misinformation. Instead of being too cheap to meter it turned out to be too costly to continue. The imminent deregulation of the electricity supply in the US is the proverbial last straw on the nuclear camel's back. By allowing any electric utility to sell anywhere in the country at whatever rates the market would bear, this measure encourages more efficient suppliers at least in the short term. Utilities having nuclear power plants are finding that in some cases it might be cheaper to just write off the losses and build a new and more efficient gas based co-generation plant. It is expected that within the next year or two more than 10 nuclear power plants shall face retirement in the US. The following two news-items are just a precursor of the times

## ■ Belene Nuclear Project Cancelled

The Belene nuclear power plant in Bulgaria is dead. This unfinished nuclear powerplant was killed by a governmental decision on May 21 which stated that the plant was technically unsound and economically unviable.

The Russian-designed Belene plant had been the object of desire of several Western nuclear construction companies, including Westinghouse, which were hoping they could make profits on upgrading and completing the reactor with Western money. Construction was stopped in 1990 due to popular protest. Belene, the second nuclear power project in Bulgaria, had been on the anvil for many years. The reactors that were to be built in Belene are the same VVER—1000s that have been proposed for Koodankulam. Experience with these reactors at Kozloduy did not enthuse the new government. Their capacity factors have been just 34%.

The government stated that Bulgaria cannot continue developing nuclear energy with the existing generation of reactors. "The society has to shake off the years-long illusion that nuclear energy is cost-effective and the nuclear power plants are safe." This was said with special reference to Kozloduy, Bulgaria's first nuclear power station. "The inclusion of all present and future expenses for the storage of the highly radioactive waste

entails reassessment of all upgrade programmes. The work on the old reactors can be extended only if the safety upgrades are acceptable from an economic point of view."

An expert council made up of scientists, representatives of governmental energy-related institutions, energy companies and others reviewed a study done by the Russian institute "Atom-energoproekt" that was pushing for the completion of Belene and offering a credit worth US\$ 400 million. The expert council's decisions refuted the study and decided that the completion of Unit I of Belene is economically unjustifiable. Mentioned as a first priority in the expert council's report is energy efficiency. It stated that a consistent national energy-efficiency program in the course of 20 years can save over 1500 MW and allow the closure of the four old units of Kozloduy.

Energy efficiency makes special sense in Bulgaria because their present energy use is like India's extremely inefficient. On a per capita basis Bulgarians consume 5,479 kilowatt-hours every year—about 20% more than the average in European OECD countries.

The electricity that Belene was supposed to generate was mainly meant for export. Unlike India, even with inefficient consumption patterns, Bulgaria is surplus in electricity. It already

## ■ Yankees Getting

### Mothballed

The owners of the Main Yankee nuclear reactor announced on May 27 that the reactor will be permanent! closed and mothballed. The reactor has been shut down for about a year for a number of safety deficiencies. The owners blame the shutdown on upcoming electricity deregulation and the uncertainty that power from Main Yankee would be profitable. There is just a theoretical chance that the reactor will be bought by Philadelphia Electric, but no one really believes this will happen. This is the second permanent reactor shutdown in New England in less than six months. Connecticut Yankee closed in early December 1996.

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has 12,000 MW of installed capacity and its peak consumption in winter does not exceed 7,000 MW.

The decision also comes at a good time for other nuclear fights in the region, where plants of similar design are being proposed for upgrade—specifically the two reactors in the Ukraine (Rovno 4 and Khmelntsky 2) which the G-7 wish to fund to supposedly replace the operating reactors at Chernobyl. So, this is great news which could reverberate in all Central and Eastern Europe!

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# Fire leads to Meit-down of People's confidence in Japanese Nucleocrats

**J**apan has aggressively pursued nuclear energy in order to ease its dependence on imported energy sources such as oil. It remains one of the few countries developing breeder technology. About 30 percent of Japan's power comes from nuclear plants.

On March 11 at 10.06 am local time, a fire broke out at the nuclear waste disposal facility near Tokai village in Ibaraki Prefecture just north of Tokyo, Japan. This fire led to an explosion about ten hours later. The blast shattered windowpanes and destroyed a hatch and a thick lead door. This door isolated the hazardous area from the areas beyond, its destruction exposed the environment to contamination.

The waste disposal facility concentrates low level liquid nuclear waste and mixes it with bitumen in a process called bituminization. The fire started in the room where barrels are filled with bituminized waste. Since the liquid waste arises from reprocessing, it contains caesium, strontium, ruthenium as well as plutonium and trans-uranic elements

## *Nero Fiddled!*

### *Nucleocrats Prefer Golf*

Power Reactor and Nuclear Fuel Development Company (PNC) the owners of the plant, assumed that the fire had been successfully extinguished by a manually operated sprinkler, even though the room was still full of smoke; this serious error led to the explosion 10 hours later.

Senior staff started a four-day golf tournament on the day of the accident and they continued playing both that day and the next day when it was realised the accident was much worse than initially thought. One of the staff who took part in the golf competition said

they thought "it would be wrong" to cancel the game when they had reserved the golf course.

The government sought criminal charges against its own nuclear development agency because a series of accidents and coverups have angered the public and spurred doubts about the program's future.

The Science and Technology Agency filed a criminal complaint with police asking them to pursue charges against the Power Reactor and Nuclear Fuel Development Corp., or Donen, for falsifying facts regarding the accident. Donen said in an official report to the government that someone had confirmed the fire had been put out, but no such confirmation had occurred.

Donen acknowledged that several officials acted together to falsify the report, and it has demoted five of them. At least 37 workers were exposed to low doses of radiation during the plant accident, classified as Japan's worst.

For years, there seemed to be no stopping Japan's controversial programme to use highly toxic plutonium to make energy, despite mounting protests at home and abroad. The unprecedented action against state backed Donen is a sign of growing resolve in government circles to heed calls for reform. Prime Minister Ryutaro Hashimoto, speaking of Donen after the Science and Technology Agency's announcement, promised to "investigate them thoroughly and beat them into shape."

The action against Donen came a day after the government said Donen waited a full day before disclosing that an experimental reactor in Tsuruga, western Japan, was shut down because radioactive water leaked from an exhaust pipe.

Another controversial Donen project is located in Tsuruga - prototype breeder reactor intended to run

on plutonium. An accident and subsequent cover-up there in December 1995 further marred Donen's reputation.

Yukio Kurita, governor of Fukuoka Prefecture where Tsuruga is located, told reporters that

"Donen can no longer be trusted

with Japanese energy policy unless it is completely overhauled."

Anger is also growing against Donen's overseers in government, something Science and Technology Agency chief Riichiro Chikaoka acknowledged during a news conference. "This is something we really have to work out very soon or else Japan's entire energy program itself could grind to a halt," he said.

Despite the action against Donen, some anti-nuclear activists say it is too early to hope for the kind of fundamental overhaul they're looking for in Japan's nuclear development program.

"I doubt that much will change," said Hideyuki Ban of the Citizen's Nuclear Information Center. "Japan's plutonium program still needs to be completely rethought."

*Source: Nuke-Info Tokyo*

*Japan Atomic Energy Commission (AEC) Chairman Riichiro Chikaoka has confirmed that Power Reactor and Nuclear Fuel Development Corp. (PNC) will be scrapped and replaced with a new organisation which will focus on fewer projects.*

## Taiwanese Shipments of Nuclear Waste to North Korea

apioca, Taiwan's government-run power utility, signed a contract in January to ship up to 200,000 barrels of low-level waste for final storage in North Korea. Strong local opposition by the indigenous Yami people to the dumping of nuclear

Ho. "Taipower has misled the people of Taiwan, the international community and the governments of neighbouring countries about the dangers associated with shipping and disposing of their radioactive waste in North Korea."

### *The Taiwanese export their spent raisins Indians dump them near streams*

During the survey at Rawatbhata Nuclear Power Station in Rajasthan we found coffee and white coloured bead like substances dumped near streams. On being shown pictures the then AERB chief exclaimed, "What are these spent resins doing there!"

The Greenpeace team was accompanied by John Large of Large & Associates, a British nuclear engineering firm retained by Greenpeace to do an independent evaluation of Taiwan's nuclear waste sector. The group conducted a 10-day study of the nuclear waste sector, and inspected waste facilities at the Kuo Sheng nuclear power plant and on Lanyu Is-

land.

waste in shallow trenches on Lanyu Island, 65 kilometers off Taiwan's Southeast coast, and by five candidate communities for a new waste disposal facility on Taiwan, forced the company to search abroad. They failed in attempts to dump the waste in the Marshall Islands and Russia. North Korea, impoverished by the years of misrule by "great leader" Kim ul Sung and clan is suffering a severe famine this year and is willing to pay any price to gain hard cash. If the shipments proceed, they set a dangerous precedent: it would be the first time, anywhere, that radioactive waste is exported for final storage.

Greenpeace announced on May 15 the discovery of major misrepresentations in the classification of radioactive waste to be exported by the Taiwan Power Company (Taipower) to North Korea. Greenpeace spokesperson Ho Wai Chi said the discovery raises serious concerns for the safe transport and storage of the waste. "The waste is significantly more radioactive than Taipower claims," said

They discovered that (he so-called low-level radioactive waste, which Taipower plans to export to North Korea, contains ion exchange resins and filter masses, some of the most dangerous wastes produced by nuclear reactors. Ion exchange resins are used to strip liquid streams in the reactor primary circuit and irradiated (spent) storage fuel ponds. The resin beads or pellets concentrate a wide range of (radio) activated and fission products. In terms of (radio) activity and persistence (half-life) ion exchange resins are very active (20.1012 Bq/m<sup>3</sup> to 200.1012 Bq/m<sup>3</sup>) and very long-lived (tens of thousands of years). The current Taiwan nuclear program will generate approximately 100-120 m<sup>3</sup>/year raw ion exchange waste, or about 200-290 m<sup>3</sup> packaged per year. "The waste that Taipower chooses to call low level, and claims will not demand special handling, is actually a soup of highly radioactive poisons that requires complex technology, highly trained personnel, and a fully devel-

oped infrastructure in order to fulfil the most rudimentary safety requirements," said John Large. He added "By exporting their waste. Taipower is creating the potential for serious environmental consequences for North Korea. Taipower must deal with its own waste, including removing it from Lanyu Island, and it must immediately cancel this dangerous and irresponsible agreement with North Korea"

Although no international agreement at present bans waste exports, the scheme is clearly in violation of the principle of the International Atomic Energy Agency (IAEA) that radioactive waste must be cared for in the country of origin unless safety of treatment is enhanced by export. The IAEA General Conference Resolution of September 20, 1996. states "Radioactive waste should, as far as compatible with the safe management of such material, be disposed of in the State in which it was generated, whilst recognising that, in certain circumstances, safe management of radioactive waste might be fostered through voluntary agreements among Member States to use facilities in one of them for the benefit of the other States," The principle is repeated in Point IX of the Preamble to the Draft Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management. The convention will be opened up for signature in September or October 1997. All countries will be able to become parties to the Convention, not only IAEA member states. The Director General of the IAEA said on May 27, in South Korea, that the planned waste Taiwan-North Korea exports will not be supervised by the IAEA: "No international organisation has supervisory rights"

Source' WISE News Communiqué

# *With the Instability of a Greek Tragedy*

## *The Continuing Disaster at Kaiga*

*Tragedy makes the best theatre. We know the inevitable end and yet we watch fascinated as it unfolds. There are warnings galore of the impending disaster but the protagonists in their hubris continue on their disastrous course.*

*The construction of a series of nuclear reactors at Kaiga has all the makings of a Greek tragedy except one. The ancient Greeks concerned themselves with doings of heroes. The actors on the Indian nuclear stage are anything but that.*

*The following is taken from two news-reports which appeared in the Deccan Herald of April 22 and 24, 1997. It is said of the Bourbons of France that they forgot nothing and they learnt nothing. The Indian nuclear establishment can any day put imperial France to shame. It has not only learnt nothing but it feels that there is nothing to learn. Even lowly station directors issue statements where losses of billions of rupees are tossed away as if they were peanut shells. The chairman, doesn't feel that he has a responsibility to the public to explain the most ridiculous accident in a nuclear power plant anywhere in the world. Leave alone giving explanations to public, the establishment doesn't even think that they need to fix responsibility for an accident Which if it had occurred after the reactor had started operations would have meant a write-off of vast stretches of land and untold misery to people. Without going into the technical details of "radial tensions generated by inadequately grouted cables, (see below) one can still be amazed at a system which allows contractors and designers to summarily change plant specifications at will bypassing the whole system of multiple checks and certifications. But the most amazing fact of all is that we the people stand for all this nonsense and allow such shenanigans to take place without protest.*

*What is a few thousand crores here and there!*

The two 220 mega-watt reactors of the Kaiga nuclear power project are likely to be commissioned during 1998-99, slated its Director V K Sharma.

Speaking to Deccan Herald, he said the cost of the two units was estimated to touch Rs.2,275 crore. This massive hike in cost, from the original estimate of Rs.774 crore in 1984, had resulted from the collapse of one of the reactor domes three years ago, rupee devaluation and price escalation.

Work on these two units of the six-reactor project coming up on the banks of the Kali river, to the east of Karwar, "is progressing at an even pace with only some mechanical and civil constructions pending"



Mr Sharma said that because of the delay in commissioning the reactors, an annual interest burden of Rs.150 crore had to be borne. The two units were initially scheduled for completion in 1995.

*Trust me!*

*Look at my excellent record*

The reactor dome failed because of its inability to withstand radial tension generated due to pre-stressing of cables, which were inadequately grouted, Mr Sharma said. Affirming that the design was weak and faulty, he said new specifications • such as increasing the dome thickness by 110 mm and changing the concrete grade from M45 to M60 - had been incorporated.

Similarly, the placement of cables had been made less congested, radial reinforcement added and quality control on construction tightened. How-

ever, Mr Sharma revealed that other than these specifications, the overall design had not been changed.

*Those not responsible have been punished adequately*

Nor had the designer and contractor been replaced, even though the contractor had been found to have deviated from the specifications "with the consent of the designer". Describing the dome failure as an error in judgment, Mr Sharma said only some of the personnel involved in the project had been shifted out.

Following the incident, two inquiry committees set up by the Atomic Energy Regulatory Board and the Nuclear Power Corporation of India Limited probed the causes of the dome's collapse. These bodies, though differing on the exact cause of failure, have listed certain deficiencies in design and execution but have not fixed re-

sponsibility on any party. Given the interest burden, it is more important to speedily reconstruct the dome. Mr Sharma felt.

The Kaiga project, situated amidst verdant hills barely 20 km from Goa's southern border, has raised apprehensions about the effects of an accidental radioactive fall-out from the uranium-based plant on human health and environment, among the surrounding population particularly after the dome failure.

Responding to these fears, Mr Sharma asserted that nuclear power was benign and ecologically safe. The only two nuclear accidents that occurred in the world, at Chernobyl in the erstwhile USSR and Three Mile Island in the United States, were due to technical faults.

*But for its own weight, the reactor can withstand anything and anyway radiation is good for you!* He said the Kaiga plant was designed to withstand natural calamities like cyclones, seismic tremors and flooding. Besides, it allowed for double containment of radioactive leakage, a 3.2 km exclusion zone which was more than the globally adopted limit. Moreover, a recent World Health Organisation study had ruled out that radiation caused cancer, he said.

*Public Accountability?  
Never Heard of it!*

A high-power parliamentary panel has asked the Department of Atomic Energy (DAE) to clarify whether the Kaiga nuclear plant unit-1 received the Atomic Energy Regulatory Board's (AERB) approval.

According to a recent report of the parliamentary standing committee on energy, the action taken on the report submitted by the department did not clearly mention whether it had got the

nod of the board for the revised design of inner container (IC) dome of the Kaiga unit-1.

The IC dome had collapsed two years ago delaying the execution of many other on-going projects, including Kaiga-2. While the DAE apprised the committee that the revised designs for the Kaiga-2 and the Rajasthan Atomic Power Plant units 3 and 4 had been approved by the AERB, there was no mention about the Kaiga-1. the report said.

The 44-member committee also wanted to know the clearance given by the board to all the units, including the design of the supporting structure required for casting the dome as well. It urged the department to inform it of the progress of all the units in the pipeline from time to time.

*Oliver Twist resides at Anushakti Bhuvan*

The committee, headed by former Jammu and Kashmir Governor and Lok Sabha member Jagmohan, expressed serious concern over the department's inability to utilise all the budgeted funds during the Eighth Plan period. The shortfall, according to the report, had been due to the DAE's inability to mobilise enough internal and extra-budgetary resources.

The department apprised the committee of its efforts to seek an enhancement in net budgetary support by Rs.330 crore and a corresponding reduction in IEBC for the current year plan. The DAE has also requested the Union Finance Ministry and the Planning Commission to substantially step up the equity support of the Nuclear Power Corporation (NPC) from the present Rs.345 crore to Rs.1,000 crore and is currently awaiting their reply.  
*Source: Based on two items in Deccan Herald*

## *A Voice From Within*

### *Opposition to Science Based Stockpile Stewardship Programme*

The US like other nuclear weapons powers is poised on the horns of a dilemma. On the one hand they already have too many nuclear weapons. Thousands of them, in fact. They realise that they, or anybody else for that matter does not 'need' so many. On the other hand, years of nuclear weapons production has created a strong lobby which has known nothing else and wants to continue doing the same.

A world where nuclear weapons constitute the currency of power is an inherently extremely unstable world. Countries which do not already have these weapons but have notions of their 'rightful' place in the world, hanker after them in (he hope that possession of nuclear weapons will confer on them the status of a 'big' power. Countries which already have the weapons feel like passengers in third class compartment that no new member can be allowed to join the already overcrowded 'club'

In this cauldron of dubious motives are the vast majority of ordinary folk. People like you and me, who realise that these weapons are unhealthy for them, their children and other living beings. They want a world free of nuclear weapons and in these democratic times they need to be propitiated by at least some semblance of effort towards elimination. How to keep (he people satisfied while at the same time maintaining super power status and control is the dilemma.

Bill Clinton's solution to this has been ingenious. Freeze is the key word here. Freeze everybody where they are on the nuclear learning curve. No new tests and no new military fissile materials production. With all the world congealed at the current level, the status-quo as regards power is also fro-

zen solid and besides you earn the gratitude of millions for having the vision to take the world away from the dangerous nuclear course!

Like always there is a fly in the ointment. Two flies actually. One is India with Pakistan in tow. Being used to third class travel for ages, they know that create enough of a nuisance and you are bound to get accommodated.. But the other fly are the weaponeers in the nuclear weapons states themselves. They are loath to give up a life-time's lucrative and stimulating occupation, just so that the world could be a safer place to live in and unlike India, these guys have clout.

To give his grand design a chance, Bill Clinton capitulated before the weaponeers. To get their support or rather to prevent their active opposition to the Comprehensive Test Ban Treaty, he bribed them and Clinton is in a position to give far more than a King's ransom! The result has been a \$40 billion giveaway called the Science Based Stewardship Program. All kinds of new gadgetry and facilities where new physics can be learnt without carrying out the tests with their unpopular fallout, so that new exotic weapons can continue to be made and the world made ever safer for democracy and the American way of life.

This tale ought to end here with everybody but the villain (India) happy. But, this time there is a new fly in the ointment!

Writing in Nature, Ray Kidder, now retired, but who worked on weapons at the Lawrence Livermore National Laboratory for 35 years, says that government plans to "manage" the nuclear warhead stockpile won't work. It could, he argues "be maintained certifiably reliable and safe for decades (or even centuries) by continuing the assiduous and perceptive surveillance that has been practised for many years."

The government argument is that they will have to continue basic warhead research simply as a matter of national and international security, and they will have to understand what is happening to the existing stockpiles just to keep them safe and they will have to keep up teams who know how to make bombs because these are also the people who know how to dismantle them as they become dangerous.

The US is dismantling warheads at the rate of about 1,800 a year; it has stores of about 8,000 lumps of plutonium already removed from the weapons stockpile by the remaining arsenal is still vast, and likely to stay so for decades. The fissile plutonium in the warheads remains a potential target for terrorist theft but is otherwise safe; the metal casings, however and the high-explosive triggers and plastic components are likely to deteriorate with age. The US Department of Energy has announced a 10-year, \$4bn a year programme to make changes in both the material in warhead, and the designs.

This is what upsets Kidder. He argues that it would be perfectly safe simply to "remanufacture" an already tested weapon: there is no need to change the material in it or the design. As Kidder sees it, the government expects that "expertise" can be maintained only if scientists are kept busy continuously modifying weapons, and improving the physics involved in their destructive power. They will do this by "zero-yield" testing explosions that won't actually cause a self-sustaining nuclear chain reaction and they are proposing to do this 1000ft underground at the Nevada test site, deep enough to conceal a real test of nuclear warhead.

### *Activists disrupt nuclear ceremony*

On 29 May, US anti-nuclear activists staged protests at the Lawrence Livermore nuclear weapons laboratory in California, during a "ground-breaking" ceremony presided over by US Energy Secretary Federico Pena.

The ceremony was to mark the start of construction of the National Ignition Facility (NIF). It included a video on two giant TV screens of the face of Edward Teller, "father of the H-bomb". When this appeared, ten demonstrators within the grounds revealed T-shirts bearing the slogan: "Nuclear insanity for ever" and stood in silence holding hands in front of the official "ground-breaking" site.

Meanwhile more than 200 people outside the fence sang, chanted and displayed slogans. Thirty-five were arrested at the Visitor's Gate as they tried to serve the lab with an "Order to cease and desist from illegal activities" (...such as the NIF). Local police did not accept their claim that Lawrence Livermore was breaking the law by ignoring the World Court ruling that "there exists an obligation to pursue in good faith and bring to a conclusion negotiations on nuclear disarmament in all its aspects..."

He thinks that all the weapons laboratories need to do is remanufacture new warhead as old ones deteriorate. That would not be misunderstood. An attempt to try new, however, could be interpreted as a step towards "novel" weapons. And, he says, it is no good the Department of Energy suggesting that remanufactured weapons would not be reliable.

Since 1972, there have been 17 "stockpile confidence tests". One of the warhead tested was nearly 30 years old. In all but one of those tests, neither the age of the weapon nor the way it had been put together made any difference to the outcome. A result like that Would not have been possible if the designers had not done the job properly in the first place.



# Space Probe Explodes, Plutonium Missing

**I**t was brighter than the brightest star, said John Van der Brink, and had tail about 12 times the width of the full moon with "sparkling bits sort of coming off the back of it. This was an extraordinarily spectacular event."

From his vantage point in the mountains of northern Chile where he and his wife had gone to watch meteors, he had "no illusions that it was anything other than a piece of space debris" falling to Earth through the ink black night sky. Van der Brink recently retired as an electronics specialist from the European Southern Observatory in Chile.

Leo Alvarado, a postgraduate student of geology from Chile's Universidad Catolica del Norte, who had been driving with four colleagues across the Atacama Desert in northern Chile, saw it too, changing brilliant colours as it came down. "We watched it break up into many pieces and burn," he recounted.

What they and other eyewitnesses saw last November 16 was Russia's Mars 96 space probe descending along a swath of Chile and Bolivia and scattering its remains across a 10,000 square mile area. The probe carried about a half pound of deadly plutonium divided into four battery canisters that were to serve as electricity sources for Mars rovers. Like their US counterparts, the containers were touted as sufficiently strong and heat resistant to remain intact, no matter what. The US is now admitting that may not have been the case.

"Named after Pluto, god of the underworld, (plutonium) is so toxic that lest than one-millionth of a gram, an invisible particle, is a carcinogenic dose," emphasised Dr. Helen Caldicott, president emeritus of Physicians for Social Responsibility. If the

probe "burned up and formed fine plutonium oxide particles...there would be an increased hazard of lung cancer," commented Dr. John Gofman, professor emeritus of radiological physics at the University of California at Berkeley, who investigated the 1964 crash back earth of a US SNAP-94 (System for Nuclear Auxiliary Power). When its plutonium-fuelled space power system burned up in the atmosphere. 2.1 pounds of plutonium vaporised and dispersed worldwide. Dr. Gofman has long linked that accident with an increased level of lung cancer.

## *What Me Worry!*

"There are two possibilities," says Gordon Bendick, director of legislative affairs of the National Security Council, about the fate of the canisters. "One, they were destroyed coming through the atmosphere (and the plutonium dispersed]. Two, they survived and impacted the earth and drove through penetrating the surface ... or could have hit rock and bounced off like an agate marble. ...I don't give any credence for any one (possibility] because I don't know."

"If the canisters burned up in the atmosphere, bottom line here, if they weren't heat resistant enough to stand what I would call a nonstandard re-entry pattern, the release was may be up to 200 grams of plutonium. which is like a drop of blood in the Pacific Ocean. There is no environmental problem with a couple of hundred grams. ...If in fact this thing survived re-entry into the atmosphere and these things came down and crash impacted on the Earth — they were meant to penetrate the Mars, their original target — they'll never be found. And even if they did and were found, people could walk around with them in their pants pockets for the rest of their lives and *never* be bothered. ...If it became paniculate matter after diffus-

ing in the atmosphere, burned plutonium would be much similar to open air testing that the French did in the Pacific as recently as a few years ago Nor was that possibility dangerous, since 'we can find no positive casual link between radioactivity released in atomic bomb testing done by the US in Utah, for example, and cancer."

Such serenity did not always reign When the US Space Command announced on November 17, 1996. that the wayward Russian probe "will re-enter the Earth's atmosphere ... with a predicted impact point ... in east-central Australia" in a matter of hours. President Bill Clinton telephoned Australian Prime Minister John Howard He offered the "assets we have in the Department of Energy" to deal with any radioactive contamination (Clinton was planning to fly for a state visit, the first stop before an Asia tour)

The Australian military and government were placed on full alert The US television networks all featured stories on their Sunday evening news programs Some people "hit the panic button when President Clinton rang the Prime Minister," reported the *Irish Times* from Adelaide: A "national crisis" had been "sparked by this inter-planetary ballistic bungle." Others hit the bottle: "A barkeeper in the tiny outback town of Tibbooburra offered his customers free beer after officials announced the probe might land in a nearly swamp. A bookmaker in central Australia's Alice Springs said dozens of gamblers tried to place bets on where the Russian probe would crash."

## *Masters of the Idle Boast*

"Masters of Space" is the motto of US Air Force Command (US SPACE COM) — The arm of the U S Air Force charged with space warfare and tracking man-made objects in space. They made a series of spectacular blunders Though November 17, the day *after*

the Mars 96 space probe had already fallen on South America, the Space Command remained focused down under.

On November 17, the Space command made a prediction: The probe would fall not on Australia, but to the east, in the Pacific. "Mars '96 probe landed in the water," heralded *USA Today*. "That means the radioactive batteries in its lander vehicles with their ...ounces of potentially lethal plutonium, lie at the bottom of the ocean."

Prime Minister Howard went before Australia's House of Representatives: "It does appear that what we all have is a happy ending to the saga of the Russian spacecraft." The *Washington Post* ran the headlines: "Errant Russian Spacecraft Crashes Harmlessly After Scaring Australia."

They were all wrong. On November 29, It days later, the US Space Command completely revised its account: "We now believe the object that re-entered on November 17, which we first thought to be the Mars 96 probe, was in fact the fourth stage of the booster rocket, rather than the probe itself and the batteries.

### *Racism and Spacism*

But the problem went beyond simple technical incompetence. "You can clearly see the double standard," charged Houston aerospace engineer James Oberg., "Australia got a phone call from the President, and Chile got a two-week-old fax from somebody. Are the lives of Australians worth more than the lives of Chileans?"

Months later, the fate of the probe and the plutonium it carried remains unclear. The US, which gave a presidential-level pledge of "assets" to Australia to deal with any radioactive contamination when it looked like the probe was falling on Australia, was not providing any assistance to Chile or Bolivia. Dr. Luis Barrera, an astrophysicist and director of the As-

tronomy Institute at the Universidad Catolica del Norte, said that NASA officials had e-mailed him thanking him for gathering eyewitness accounts of the probe's disintegration. Then the agency's interest subsided. He suspects NASA doesn't want too much attention paid to this event because bad publicity might impact on NASA's already controversial plan to launch a reco 1723 pounds of plutonium on its Cassini probe scheduled for October. The Russian government has been "uncooperative," said Barrera, still not giving Chile a description of the canisters so that searchers would know to look for -if the batteries remained intact.

The US news media were similarly blase about the implications for Latin America. The *New York Times* relegated the story to a five-paragraph Reuters dispatch under "World News Briefs" buried inside its December 14 edition.

As to why the US was not providing the "assets we have in the Department of Energy" that Clinton promised Australia? According to Bendick at the NSC, "It's not the United State's responsibility to protect the world from this.... We told Bolivia and Chile that we would provide technical assistance, but they haven't requested any. They asked for technical data and we provided information on the radioactive combination of the air, the ground and the water, and we said it is negligible."

There did not, however, seem to be any hard evidence for that optimistic assessment. In January, the Chilean government asked its ministers of Defence and Interior and the Chilean Nuclear Energy Commission to conduct a study "to determine with absolute certainty if there was radioactive contamination. There is concern because the water source for several cities is in the impact region.

### *Accidents Happen*

While the Mars 96 accident reminds us all that not only *can* accidents happen, but they do happen with disturbing regularity.

Bringing that message home in a spectacular way on January 17 there was an explosion of a Delta 11 rocket lofting a \$40 million US Air Force navigational satellite. The 12-story, \$55 million rocket blew up 13 seconds after launch. As the burning fragments descended over a wide area, a cloud of toxic chemicals formed above the site and began drifting out to sea. then back to land and then south along Florida's Atlantic Coast. It contained nitrogen tetroxide and monomethylhydrazine, components of the rocket's fuel - both described by NASA documents as "deadly if a person comes into contact" with them. Residents as far as Vero Beach, 100 miles away, were told by the Cape Canaveral officials to stay inside, close all windows and doors, and turn off air conditioning and heating units. At the Cape Canaveral Elementary School, Brad Smith, a fourth • and fifth-grade teacher, described the cloud as having "weird purples and blues and reds." He said he pushed wet paper towels under the door to his classroom to keep the rocket fumes away from his students.

The accident occurred just where a Titan IV rocket is scheduled in October to launch the Cassini probe that will be carrying 72.3 pounds of plutonium. Flight failures are fairly routine and any claims that there is no real danger from Cassini is false. Nuclear cargo is a setup for catastrophe.

### *Dispersing Danger*

Whether or not Cassini explodes or is even launched, its use of radioactive material has already done damage. In July 1996, Los Alamos National Laboratory reported increased contamination of workers and equipment and cited work on Cassini's plutonium-fuelled systems as the primary cause.

Plutonium, stresses Greg Mello of the Los Alamos Study Group, is inherently dangerous to work with and "increased work with plutonium will cause increases in worker exposure."

If the Cassini mission goes forward, many more people could be impacted. The initial danger is that a blow-up on launch could break open or melt the plutonium-carrying canisters and spread radioactivity. The second potential flashpoint is the "slingshot manoeuvre" planned for 1999. In this "flyby" scheme, 22 months after launch, NASA will swing Cassini back towards Earth in order to use the planet's gravitational force to gain enough velocity to propel the probe on to Saturn, its final destination. During that Passover. Cassini is to fly just 312 miles above the Earth's surface. But if there is a miscalculation or malfunction and it comes in too close and undergoes what NASA calls an "inadvertent re-entry." it could burn up upon hitting the 75-mile high atmosphere, spreading plutonium over a wide area.

NASA PR material gives the impression that even then, the plutonium would not be dispersed as cancer-causing vapour and respirable particles. But, in fact, the space agency's *Final Environmental Impact Statement for the Cassini Mission* totally contradicts that, saying, if the Cassini probe dips into the Earth's atmosphere during the "flyby," a sizeable portion of the plutonium fuel should be released, including much of its as "vapour or respirable particles."

The NASA Final Environmental Impact Statement for the Cassini Mission also says that if there is such an "inadvertent re-entry" during the planned Earth "flyby" of Cassini on August 16, 1999. and the probe breaks up dispersing plutonium, "approximately five billion of the estimated seven to eight billion world population...could receive 99 percent or more of the radiation exposure."

Despite the danger signs with which Mars 96 and Delta II lit the sky, the Clinton administration is pushing ahead not only with Cassini, but with other nukes in space. In September, the administration announced a national space policy that includes the development of nuclear-propelled rockets for military and civilian uses. The Defence Special Weapons Agency will work on "multiple nuclear propulsion concepts" for military missions, while NASA's Marshall Space Flight Center's Advanced Concepts Division, along with Los Alamos National Laboratory, will develop nuclear propulsion for civilian uses.

Meanwhile, at the 14th Symposium of Space Nuclear Power and Propulsion in Albuquerque in January, scientists from Brookhaven National Laboratory recycled a plan to rocket high-level nuclear waste into space. The US government had proposed this same scheme decades ago, but rejected it out of fear that an accident on launch or a fall back to Earth would douse the planet with atomic waste.

US acknowledgement that radiation may well have been released over Chile and Bolivia when the Mars probe nosedived back to Earth is tacit admission that safety systems are not fool-proof.

Says John Pike, director of the Space Policy Project of the Federation of American Scientists: "If you liked Mars '96 you'll love Cassini."

Karl Grossman



## *It is a Small World*

### **SELLAFIELD CAESIUM FOUND IN ARCTIC OCEAN**

New figures show that caesium contamination from the Sellafield reprocessing plant in UK has reached Canadian waters. The contamination, which has never been detected so far north, is having a bigger impact on the Arctic than the Chernobyl accident, according to new Canadian data. Iodine-129 from Sellafield has shown up beyond Siberia to the north-western shores of Canada at a depth of 200

***Despite the  
danger  
signs, the Clinton  
administration is  
trying to populate***

meters the radioactivity is 10 times greater than the background level from nuclear weapons fallout. It is estimated that Sellafield has released 40,000 billion Becquerels of caesium-137. So far, about 15,000 billion becquerels of this have reached the Arctic. That is between two and three times more than the contamination from Chernobyl in the same ocean. The largest discharges from Sellafield up to now were in the late 1970s and early 1980s, with peaks in 1975, 1977 and 1980. The same peaks showed up four years later in the Barents Sea. North of Norway the radioactive plume splits itself in two. Part of it goes along the Siberian coast and crosses the North pole towards the

Canadian coast, another passes north of Iceland via the south coast of Greenland to the Canadian coast The research was led by the Bedfors Insti-

tute of Oceanography in Halifax, Scotland.

*Source New Scientist. 10 May 1997*

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*Barrow-in-Furness, Cumbria LA 14 2HT. UK*

*October / November 1996*

# *All is Just Not Kushaal at Khushab*

U.S. officials last week categorically denied a report from Pakistan which claimed that an unsafeguarded reactor near Khushab has started operating. One official monitoring nuclear developments in Pakistan told *Nucleonics Week* instead that "all the data at hand indicates that the reactor is still cold."

Two weeks ago, the Pakistan English-language newspaper *Dawn* asserted that the reactor is finished and has started up, but cannot produce electricity or reach full power because of a shortage of heavy water

Western officials conjectured that the Pakistan claim may have been triggered by a construction milestone at the reactor site or planned in response to recent reports that India has deployed the Prithvi ballistic missile.

In 1994, Western officials had claimed that Pakistan was building a plutonium production reactor, rated at between 50 and 70 megawatts thermal, at a site near Khushab. These sources later added that intelligence pointed to construction of a fuel fabrication or reprocessing centre near the reactor. As late as this April, however, a member of the Pakistan Atomic Energy Commission denied flatly that the reactor existed.

According to one U.S. official this week, however, the Khushab reactor "is definitely out there" but not scheduled to be finished "until later this year or sometime in 1998." Another official said that, under the most optimistic schedule, completion of the reactor "is several months away." Sources indicated that the reactor had not yet undergone cold testing, let alone become critical.



The Pakistani report suggested that the reactor would be used for electricity production as well as for isotope production. Recent surveillance photograph of the site, however, do not indicate, that Pakistan is building power grid infrastructure, such as turbine generator of equipment, for electricity generation over, Western officials said, it is not believed that reactor's chief purpose is isotope or silica production, as stated in the Pakistani account. Pakistan has a technical co-operation program with the IAEA for these activities, "but none of this has got anything to do with Khushab," one Vienna official said, and the IAEA "has not been informed" by Pakistan that the reactor is under construction or that Pakistan plans to incorporate the unit into its existing technical co-operation program.

Sources said that, because Pakistan is facing a massive financial crisis, the U.S. and other creditor countries supporting the International Monetary Fund are trying to leverage Islamabad to keep the reactor from operating outside of IAEA safeguard. Dr. Zia Mian, a research fellow at the Union of Concerned Scientists in Cambridge, Mass observed, "If Pakistan were to start operating the reactor now, it would be taking a very major foreign policy step," demonstrating to the world that its unsafeguarded program is going forward regardless of U.S. opposition, and escalating military nuclear activities to include significant plutonium production.

## *Indian Report Also Unconfirmed*

U.S. officials last week confirmed the assertion by *Dawn* that a critical factor which may indefinitely delay full-power operation of Khushab is shortage of heavy water. But they did not confirm recurring Indian reports that China, which the U.S. believes to have supported construction of Khushab,

also provided heavy water for it. According to Western intelligence sources, a full inventory of heavy water for the unit would be about 15-17-metric tons (MT), though it could go critical with a smaller amount.

Indian sources said that, in 1996, China sold Pakistan 40 MT for Khushab. U.S. officials said the Indian government had told Washington this recently, but U.S. government agencies "could not confirm" the Indian assertion. A U.S. officials said last week that, when New Delhi made the allegations to Washington, the U.S. "went back to the Chinese on this" and received assurance from Beijing that Chinese entities did not sell heavy water to Pakistan for Khushab.

According to the Pakistani report, administrative difficulties in Pakistan had prevented heavy water from being allocated for the Khushab reactor. Sources said that, in fact, most of Pakistan's scarce heavy water resources have, over the last two years, been allocated for the Karachi Nuclear Power Plant (KANUPP), which requires massive quantities of heavy water but which is also safeguarded. That allocation, sources said, reflected a general policy by Pakistan under former prime minister Benazir Bhutto not to take any step, such as producing high-enriched uranium (HEU) at the Kahuta centrifuge enrichment plant, which would be seen by Washington as provocative and escalating regional nuclear tension. One source said, "Keeping heavy water at Kanupp and away from Khushab should be seen by Washington as going hand-in-hand with not enriching uranium to HEU."

— Mark Hibbs, Bonn

*Nucleonics Week—July 3, 1997.*

## • *The Peripatetic Editor Goes Globe-Trotting*

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When the cat is away the mice will play is an old saying. The *Anumukti* team is of course no cat and mouse operation, but still, when the editor goes globe-trotting, the regular production of the journal does suffer. This year, while the monsoons seems to have taken a break in Vedchhi, invitations for visits to distant lands have started pouring cats and dogs and being a self-indulgent sort. I have been unable to say no.

For five weeks during April and May, I went to U.S.A. at the invitation of Institute for Energy and Environmental Research in Washington. The purpose was to present an Indian NGO view at the preparatory meeting of the Nuclear Non-Proliferation Treaty (NPT) at the UN in New York. And at the beginning of May, I was invited by the Military Production Network—a network of antinuclear groups living near US military nuclear facilities—to come and see how they lobby their politicians. In between there was an opportunity to visit weapon's laboratories like the Los Alamos National Lab and the Lawrence Livermore Lab to meet weaponeers and try to understand their point of view. While in the US, I was also invited to give talks at universities like University of California at Berkeley and University of Nevada at Las Vegas and the MIT at Cambridge, Massachusetts.

The trip was both an inspiration as well as an education. It was inspiring to meet heroes (mainly heroines) of the antinuclear movement. Women who were ordinary housewives leading everyday ordinary lives when the nuclear circus obtruded into their lives, and slowly they had to learn the differences between rads and cads and curies and furies and fight the establishment while continuing their eve-

ryday lives. People like Marylia Jell who lives at Livermore and whose house is the office of Tri-Alley CAREs and who now debates as seasoned weaponeers and often 'as them tongue-tied. There was Jav 'pughlan a mountaineer who puts trekking skills to good use the mountains around Los Alamos planting monitoring devices on them and who made me accompany him on one of his expeditions. Exhausting but what an education! And Lisa Crawford who got so mad at finding uranium in her backyard well in Fernald, Ohio, that she started a movement which has brought the uranium enrichment plant to its knees and has become a political heavy-weight. And so many others that if I were to mention them all by name, this article would read as the antinuclear Who's Who.

Everywhere I went. I introduced myself as coming from the Institute for Total Revolution. This was invariably followed by a nervous twitter which made me wonder that the Americans have by now become rather nervous of revolution. In one place, however, this introduction was followed by loud cheering. Jacqueline Cabasso who has done such wonderful work in Abolition 2000, turned to me and said. "This is Berkeley."

The opportunity to witness "lobbying" at first hand was also an experience, not to be missed. Lobbying is serious business and is undertaken with care. First of all the Military Production Network has a regular staff (one woman) in Washington who arranges meetings and schedules long before the event "DC days" takes place in beginning of May. Then there is a one day orientation camp where all the "lobbyists" including some as young as twelve and fourteen are told about whom to meet; their previous positions on issues of interest to the network;

the position of the network on various issues, etc. Before every meeting there is a pre-meeting amongst the participants and the group leader chalks out how he/she will conduct the proceedings; who will say what; who will take notes; the actual meeting is immediately followed by a debriefing session where every scrap of information that one may have learnt is analysed and if found to be important to the whole group is immediately reported. Amongst the people I met were a Senator, a Congresswoman, the head of the Nuclear Regulatory Agency, the Assistant Secretary of the Department of Energy and the Deputy Chairman of the Arms Control and Disarmament Agency.

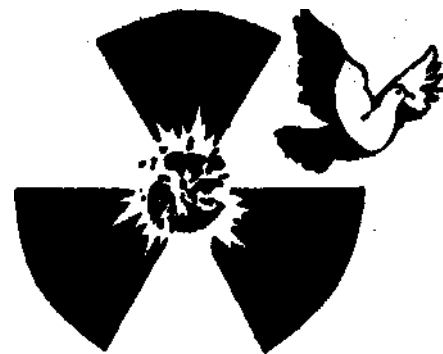
Often during the trip I found myself in an extremely strange position that of having to defend the Government of India's nuclear weapons policy. The reason being that while the official kinds I was talking to were very willing to lecture India about not having nuclear weapons. I found that their own commitment to dismantling their own huge stock of nuclear weapons was not that strong. One person said. "We don't need thousands of nuclear weapons, but we do need hundreds to defend the "Free World" I said as clearly as I could that while I personally opposed the nuclearisation of India and felt that it has been and would continue to be a disaster. I do not expect a non-nuclear India in isolation and only efforts which are seen to be genuinely disarmament efforts are likely to succeed: mere non-proliferation efforts however sugar-coated will not work.

The trip had many memorable moments. Meeting Dr. John Goffman was a long cherished dream. Time spent with my host Arjun Makhijani and his extended family at IEER; with friends like Zia Mian and Ramana, has





already resulted in access to new and startling information. The Indian government has been very forthcoming with information periodically asked by the US ambassador about the Indian nuclear programme. The heads of Department of Atomic Energy have been almost obsequious in providing this information. A good deal of such information is now available through the Freedom of Information Act at the George Washington University in Washington DC. We intend over the next few issues to publish some of these arraival documents in *Anumukti* so that readers realise what sort of information, the guys who make such a fetish of secrecy in nuclear mattter who hold the infamous Atomic Energy Act of 1962 like a stick to energy silence, who have had the gall of calling antinukes as foreign agree glow generous and forthcoming they have been with actual representative? of foreign governments.— *Surendra Gadekar*



*mukti*

*Join*

## ● *Privatise and Perish*

The Delhi based B.K. Modi group of industries has sought the opinion of the Department of Atomic Energy to set up a nuclear power plant in collaboration with the French power company Electricite du France, confirmed DAE sources.

The sources said the atomic energy establishment was open to a dialogue on this issue. "The project, if finally approved should be technically attractive and above all consistent with the country's political thinking," a DAE source told this newspaper.

Emphasising the need for international collaboration, the sources said French possessed an advanced level of nuclear technology. Chairman and managing director of Nuclear Power Corporation Y.S.R. Prasad shared the view of the DAE officials: "Our mind is open on this matter. We are awaiting the financial and technical details of the project."

During a talk on Thursday organised by the Nehru Centre, director of the Bhabha Atomic Research Centre (BARC) Anil Kakodkar said at present the power system in India was dictated by financial consideration. "NPC has evaluated certain possibilities for coughing up resources."

*Source: Times of India*

## *Six Determination: -the \$\$\$\$ way*

### *Boys or Bust*

Instead of Amniocentesis followed by murder, the better way to father boys is to join the nuclear industry. Nuclear Engineering International (NEI) has reported on a study showing that men who work at the Sellafield nuclear facility in Britain father 109 boys for every 100 girls. As NEI explained, the fact that the Sellafield work-force should produce such a high proportion of boys—the average is 105 to 100 girls—is not surprising, because younger men tend to produce a higher proportion of male offspring. However, the study also revealed that "men who had received over 10 milli-Sieverts [of radiation] in the three months before conception fathered 140 boys for every 100 girls." Of course, there is a catch to it. A study carried out by an *Anumukti* team at Rawatbhata showed that a much higher proportion of couples living near the plant were either sterile or unable to bear living children. *Source: Bulletin of Atomic Scientists*

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# ANUMUKTI

A Journal Devoted to Non-Nuclear India

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*Special Note to Drivers of Trucks Carrying  
Explosive Nuclear Waste through Metropolitan New York.*

*check oil levels every five milts.  
change fan belt every thousand.  
check tire pressure every morning..  
change tires.  
Buy radials.*

*Directions for carrying  
Explosive Nuclear Wastes Through  
Metropolitan New York.*

*Enter Long island Expressway at Brookhaven.  
Proceed west. Exit at Hoyt Street in Astoria.  
Turn left onto Astoria Boulevard. Trundle  
under the elevated tracks there. Turn  
right to ramp for the 59th street Bridge.  
Cross the Bridge. Follow local street travelling  
west until Amsterdam Avenue. At Amsterdam  
turn right. Proceed North.*

*check shocks every hundred.  
check rear-view mirror and side-view mirror incessantly.  
Keep eyes on rod.  
Grant all other vehicle and each pedestrian  
the right of way.  
Do not pass.  
Do not drive in the rain.  
Do not drive in the snow.  
Do not drive in the dark.  
Signal.*

*use headlights on high beam.  
Go slow.  
Do not break suddenly or otherwise.  
Think about your mother  
and look out for crazies.*

*June Jordan  
Atomic Ghost: Poets Respond to the Nuclear Age.*

I have been subscribing to *Anumukti* for the past few months and find it very useful. Since I live in the USA, I would like to see more information on the Indian nuclear industry. Perhaps, other readers of *Anumukti* in India can contribute by sending in newspaper clippings related to our nuclear establishment. With some critical editing and commenting, even a press release from them can provide a handle to understand what is happening within the facilities.

Apropos your editorial (*Anumukti*, Vol. 10, 41) on the Koodankulam Reactors - . The reality is that it is the Russian nuclear industry that is really in trouble. But, like nuclear establishments all over the world, they still carry a lot of clout and hence there is still quite a bit of official support for their views. The following excerpts from an article by Kalyan Shankar in *The Hindustan Times* on the sorry state of the Russian nuclear industry should be of interest in this regard.

*The future of the Russian nuclear industry does not appear to be very bright While on the one hand it does not attract the younger generation any more, many scientists of the Soviet era have left the country for greener pastures. The Russian youth today is looking for a glamorous job in a multinational company or set up his own business rather than opt for the specialised nuclear field.*

*The Russians are also worried about the brain drain and lesser investment in the nuclear industry. For instance at the prestigious Kurchatov institute in Moscow, which was the birthplace of the Soviet Union's atomic weapons programme, 7000 workers have not been paid their wages for months. The institute is reported to have received barely a third of its budgeted amount for the year 1996.*

*Continued on page 7*

Like the roof of the CANDU type reactor at Kaiga which crashed of its own weight in 1994, the whole Canadian nuclear programme seems to be crashing down, or getting delaminated to use the correct nucleo-lingo. Since Canadians were the guys who taught Indian nucleocrats their tricks, this has major implications for the Indian atomic energy programme as well.

In the early 1960s when major decisions were being taken regarding the nuclear programme, Dr Homi J Bhabha, the father of the Indian nuclear effort decided to make CANDU the main reactor type in India. The reasons behind this choice were:

- It used natural uranium as fuel instead of enriched uranium. India had no enrichment facility (it still doesn't) and did not want to become dependent on foreign suppliers for fuel.
- Uranium resources of the country were small and CANDUs had the smallest requirement of uranium both in the core and as yearly replacement. At the same time it produced comparatively larger quantities of plutonium which could be used to fuel a breeder programme with the ultimate view of utilising the vast thorium deposits of the country.
- CANDUs had online refuelling capacity which meant that theoretically they could run longer without refuelling outage, required less maintenance, gave less of a radioactivity dose to workers and were overall cleaner systems than other reactor types then in consideration.
- They were pressure tube systems and did not require manufacture of large pressure vessels which were beyond our technological capabilities.

For all these reasons Bhabha preferred the CANDUs as the mainstay of the Indian nuclear programme, despite the fact that their efficiency as electricity producers was low and they required the use of heavy water which was expensive. But for the two Boiling Water Reactors at Tarapur, all of India's nuclear power reactors are of the CANDU type.

During the early years of operation in Canada, the CANDUs' performance was the best in the world with capacity factors of many reactors in the high nineties. Unfortunately, while Canadian CANDUs were setting records as the best performers in the world, Indian CANDUs were setting records as the worst. The capacity factors of the Indian plants were usually in the low forties and sometimes in the low twenties. That is when they did run which was not most of the time. These problems were airily dismissed as "teething troubles" by Indian nucleocrats.

However, as years went by the performance of the Canadian CANDUs declined precipitously and they started rivalling their Indian counterparts. What the decision to close seven of these reactors in one shot means is that the problems of ageing that they are encountering are not capable of solution by simple means and are inherent in the design which despite its early promise has failed to live up to expectations. An organisation responsible to shareholders has decided to cut its losses in order to survive. The article on page 3 details the problems faced by Canadian CANDUs.

In our next issue, we will have a detailed comparison between the operating records of Indian and Canadian CANDUs and show that the record of the Canadians in running these reactors has been far superior to that of the Indians by any objective criteria. Thus, we should take heed from their decision to lay off seven of them in one go and shut down these fatally flawed machines while there is still time before a catastrophe strikes.

# *The CANDU Collapse*

## *Seven Canadian Reactors to Shut Down*

Toronto Ontario Hydro announced on August 13, 1997 that it would shut down its oldest seven reactors within the next year. This includes four 515 MWe reactors at the Pickering "A" nuclear station, just east of Toronto, and three 848 MWe reactors at the Bruce "A" nuclear station on the shore of lake Huron near the town of Kincardine. Ontario Hydro had previously shut down *one* reactor at the Bruce "A" station in 1995. Ontario Hydro is also shutting down Canada's last remaining heavy water plant at the Bruce site. CANDU reactors need heavy water for both coolant and moderator. Dave Martin, Research Director of Nuclear Awareness Project, stated, "This is the largest single nuclear shutdown anywhere in the world. It's the beginning of the end for nuclear power in Canada."

The Bruce "A" reactors lasted less than half of their expected 40-year lifetime. The Pickering "A" reactors lasted only 25 years, despite having been re-tubed at cost of \$1 billion (Cdn).

The shutdowns will leave Ontario Hydro with 12 reactors four at the Pickering "B" station; four at the Bruce "B" station; and four at the Darlington station. Ontario Hydro refers to the current shutdowns as 'lay ups', implying that the reactors may be re-started at a later date. However, Nuclear Awareness Project believes that the reactors will never be re-started, for economic, as well as environmental and safety reasons.

"The Ontario Hydro shutdown will also seriously hurt the chances of foreign CANDU sales by Atomic Energy of Canada Limited (AECL)." said

Dave Martin. AECL is a Canadian crown corporation that designs and markets CANDU reactors. AECL is currently seeking to build reactors in Turkey, Romania, and the Republic of Korea. CANDU performance has declined dramatically in recent years. In 1996, Ontario Hydro's 19 operating reactors ran at an average capacity factor of 66%. The Pickering "A" station had a capacity factor of 36%, and Pickering "B" 49% in 1996. Martin added, "The message is clear: do not buy CANDU reactors".

Closure of the problem-plagued Pickering "A" reactors vindicates ten years of public education work by activists with Nuclear Awareness Project and its local affiliated group, Durham Nuclear Awareness (DNA). The four ageing reactors, now over 25 years old, were the oldest operating CANDU reactors in Canada, and have been the subject of several recent controversies.

In May, it was revealed that Ontario Hydro had dumped more than 1,000 tonnes of copper, zinc and other metals in Lake Ontario. The metals were being eroded from the Pickering stations' brass steam condensers over the last 20 years. Durham Nuclear Awareness has requested an investigation under Ontario's Environmental Bill of Rights, alleging that Ontario Hydro officials knowingly reported incomplete environmental data to the Province of Ontario.

In July, Ontario Hydro revealed that it had failed to report tritium contamination of ground water on the Pickering site for the last twenty years.

In 1979 it found 2,150,000 becquerels per litre (Bq/L) of tritium in ground water, and in 1994 found 700,000 Bq/L. Tritium can cause cancer if ingested. Ontario's current "objective" for tritium in drinking water is 7,000 Bq/L, but in 1994 a provincial advisory committee recommended that this level should be reduced to 100 Bq/L, and brought down to 20 Bq/L within five years.

*While Canada decides to shutdown its CANDUs, India decides to go in for expensive retuning which as experience at Pickering shows, doesn't always work because no one in the establishment has the guts to take a decision of shutting down even worthless junk*

Ontario Hydro will increase the use of coal and oil-fired stations to compensate for the closed nuclear reactors. In the last four years, the giant utility has decimated its conservation programs, and recently cancelled its first tentative efforts at a renewable energy program for independent power producers. Added coal and oil generation will result in major environmental impacts. The Ontario environmental community is rallying to demand a truly sustainable energy future based on demand management and renewable energy, with the use of gas-fired cogeneration as a transition technology.

# *A History of Some Selected 'Significant Events' at Pickering Nuclear Generating Stations*

**August 1, 1983** — Pickering reactor 2 had a 'loss of coolant accident' (LOCA), after a pressure tube had a metre-long rupture. The entire station was shut down, and the four reactors at Pickering "A" were eventually retubed at a cost of about \$1 billion - more than the original \$716 million cost of the station.

**November 22, 1988** — Pickering reactor 1 had a power excursion caused by operator error that caused damage to 36 fuel bundles. The cooling system was contaminated by radioactive iodine, which was vented over several weeks following the accident. Ontario Hydro did not believe that such an accident was possible, and had to revise its operating procedures and retrain staff.

**September 25, 1990** — Pickering reactor 2 had a "severe flux tilt", with large power shifts in the reactor core, caused in part by the CANDU design. Staff spent two days trying to stabilise the reactor core before shutting it down, and were later criticised by the AECB for not shutting it down immediately.

**August 2, 1992** — Pickering reactor 1 had a heavy water leak from a heat exchanger that resulted in a release of 2,300 trillion becquerels of radioactive tritium into Lake Ontario. This was the worst-ever tritium release from a CANDU reactor, and resulted in increased levels of tritium in drinking water from Whitby to Burlington.

December 10, 1994 — Pickering reactor 2 had a major 'loss of coolant accident' (LOCA). A pipe break resulted in a spill of 185 tonnes of heavy water. For the first time ever, at a CANDU, the Emergency Core Cooling System (ECCS) was used to prevent a meltdown, and about 200 work-

ers were involved in the clean-up. The reactor was restarted on February 14, 1996.

**July 21, 1995** — Two technicians carried out work on the wrong reactor (Pickering reactor 5 instead of reactor 6), disabling the second fast shutdown system on reactor 5, which was operating at full power at the time.

*While The Canadians  
Shutdown Their Own  
Reactors, They Continue To  
Promote Similar Reactors For  
Sale in Turkey, Romania And  
In Other Parts Of The World*

**February 19, 1996** — About 500 tonnes of water spilled into the #6 reactor building when employees working on an Emergency Water Supply valve failed to isolate it from the system. An investigation revealed that safety equipment could have failed due to water damage, and both the primary and backup heat sinks were actually lost for a section of the reactor core. The accident blew a 60 lb. valve component 6 feet into the air, almost hitting a worker and shot water up to the reactor building dome.

**April 15, 1996** — Pickering reactor 4 had a heavy water leak from a heat exchanger that resulted in the release of 50 trillion becquerels of tritium into Lake Ontario. The level of tritium in local drinking water peaked at about 100 times the usual level.

**April 21, 1996** — All eight reactors at the Pickering nuclear stations were shut down to repair a backup valve on the Emergency Core Cooling System. The flaw was detected on April 15th, and the system had been tested one month earlier. Hydro did not advise the public of this situation until April 20th.

October 11, 1996 — "Drug paraphernalia" were found in the 'Operating Island' at the Pickering nuclear stations. A station manager commented: "The continuing discovery of such items in the plant is both embarrassing and a threat to our recovery and survival as a business." This was one of five significant event reports relating to illicit alcohol and/or drug use in the Pickering nuclear stations in 1996.

May 17, 1997 — A media report revealed that Ontario Hydro had failed to report the dumping of more than 1,000 tonnes of copper, zinc and other metals into Lake Ontario from the Pickering stations, due to the erosion and corrosion of brass steam condensers. DNA has requested an investigation under the Environmental Bill of Rights, alleging that Ontario Hydro officials knowingly reported incomplete environmental data to the Province of Ontario.

July 30, 1997 — Ontario Hydro revealed that it had failed to report tritium contamination of ground water at the Pickering nuclear generating station for the last twenty years. In 1979 it found 2,150,000 becquerels per litre (Bq/L) of tritium in ground water, and in 1994 found 700,000 becquerels/litre

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## *So far out that they might as well be in space*

### *Optimist at IAEA symposium see 1,000 new reactors by 2050*

*Nucleocrats fancy themselves as futurologists. I used to think that this was a disease confined to India. But I find that it has spread worldwide and in fact some nucleocrats abroad are worse affected. As predictors of the future they have a record which is far inferior to that of even the astrologers.*

*Just twenty years ago nucleocrats were confidently predicting that there would be 1,000 reactors by the year 2,000. With barely two years left they have over half the target still unreached. Undeterred by these minor inconsistencies, they are now saying that there would be thousand more in another fifty years. Only one thing can be said with any certainty about these latest predictions. The predictors won't be around half a century hence in case anybody wants to question them!*

**F**eatured speakers at an IAEA hosted symposium this month optimistically forecast a major expansion of nuclear power during the coming five decades. "The world will have to add up to 1,000 reactors to meet energy demand," said Dan Meneley, chief engineer at Atomic Energy of Canada Ltd. (AECL). "Our low scenario is 300 new reactors. It might be zero, but we don't expect that to happen."

Meneley summarised the third of six "key issue papers" working groups prepared by consensus for the International Symposium on Nuclear Fuel Cycle and Reactor Strategies. The

symposium, co-sponsored by the OECD Nuclear Energy Agency (NEA), the Uranium Institute and the European Commission, was held in Vienna from June 3-6, 1997. It was a follow-up of the 1980 International Nuclear Fuel Cycle Evaluation (INFCE).

The conference began by describing energy supply and demand scenarios through 2050, and continued with detailed discussion of the future of the nuclear fuel cycle.

#### *Still A Diehard Optimist*

In his opening speech, IAEA Director Blix said "new realities" had emerged since the late 1970s, when the U.S. government initiated the International Nuclear Fuel Cycle Evaluation (INFCE), "and it seems appropriate again to consider various aspects of different nuclear fuel cycle options." In 1980 he said, world nuclear power capacity in 2000 was predicted to be between 850 and 1,200 gigawatts (GW). Capacity stands today at only 351 GW and almost certainly "will not be greater than 380 GW" by 2000, Blix said. In addition, "the predicted commercialisation of fast breeder reactors has not occurred," and "the closed fuel cycle has not taken hold."

Based on three scenarios (ecology driven, middle course, and high growth), the conference's first issue paper projected world nuclear generating capacity by 2050 at somewhere between 333 GW and 1805 GW. The scenarios were based on analyses by the International Institute for Applied Systems Analysis, in Laxenberg, Austria and on data from the World Energy Council.

In a separate study prepared for the discussion, five experts from the Los Alamos National Laboratory (LANL) predicted that nuclear power would remain concentrated in the OECD countries until about 2050, then shift by 2100 toward developing countries including China. If a carbon tax is levied during the next century, LANL said, "the economic niche of nuclear power will be widened, while moderately decreasing overall primary energy demand and GNP." But, the LANL experts forecast, its impact on green house gas abatement will be limited "unless nuclear energy moves into non-electric applications."

Breeder reactors will enter the market in the 21st century, they said, "only if significant costs for fossil fuels arise" beyond those used in their model, if strong carbon taxes are globally applied, if low capital costs are possible, and under assumptions of limited uranium resources.

By contrast, the consensus issue paper assumed that fast reactors would be introduced after 2030 and by 2050 would represent about 10 per cent of the world's nuclear capacity. For LANL, a 10 per cent breeder share could only be reached around 2100, under the most optimistic assumptions.

Naoto Sagawa of Japan's Institute of BNergy Economics, forecast that nuclear reactors will supply 20 per cent of the power in the entire Asian region by 2050, assuming significant energy saving (reduction in energy intensity of 1.5 per cent annually) and an expected decline in the region's average growth rate from the current 6.2 per cent to 2.4 percent in 2030-2050. But nuclear's share in Asia could be higher, he said, suggesting

that fast breeders would be needed in Asia once nuclear supplied about 50% to 60% of total power. At that level of nuclear power output, uranium demand in Asia would reach 250,000 metric tons/year, and reactors in Asia alone would rapidly consume the world's natural uranium resources if were only on natural uranium," Sagawa said.

Meneley told a June 4 press briefing that, if China is to attain the level of environmental protection enjoyed by Western countries during the next 50 years, China "would build seven hundred 1,000 MW reactors, assuming they don't have any other resources." If that were to occur, he said, "it puts us up to the number of up to 1,200 new reactors in the world" predicted by his working group.

### *From Here To There*

But even in this gathering of Hallelujah, Praise the Lord! tub thumping believers, there were some participants who had been bitten by the reality bug. They expressed surprise that so little effort was made to discuss how the optimistic scenarios calling for major nuclear expansion would actually be realised. Former Shell executive Peter Beck said: "Too many people here were saying, we can wait, and the world will turn to nuclear power' ...In the oil business, as soon as you say your technology is mature, you're in the first stage of dying."

None of the symposium's scenarios count on renewable energy sources making a serious contribution during the next 50 years. Beck said Shell officially expects renewables to account for half the world's energy supply by 2050. "It's possible that nuclear will have only a minor role, but that prospect didn't even figure at this meeting," Beck observed.

Other experts said the lack of balance was caused by the inclusive, consensual process adopted in draft-

ing the issue papers, one technology against another. Quipped one European issue paper author, "if there is a working group of five people with someone from AECL and one Indian on it, you are going to get a forecast that a third of world's reactors by 2050 will be PHWRs and a third of the fuel burned will be thorium."

In response to a query after his paper projecting 1,000 new power reactors, Meneley explained that the authors did not concern themselves with the details of realisation. "The world will need the energy," he exclaimed. Now the reactors get built "doesn't really matter."

According to acting Nuclear Energy Agency's director General Sam Thompson, however, it is going to matter. "There can be no doubt that for some years to come, it will be difficult to make an economic case for new investment in nuclear generation if the bases for comparison of fuel costs are not radically altered," Thompson said.

Another observer noted that the forecasts presented at the symposium bore the heavy stamp of vendor companies, research and development organisations, and other technology holders "whose basic mindset is, 'when in doubt, go for a nuclear option.'"

"If any utility people had come to this meeting and had been involved in the paperwork," one U.S. DOE official said, "the results would have been more sober."

The role of market forces was barely discussed in preparation of the baseline energy scenarios for the fuel cycle studies. But Thompson warned at the outset of the symposium that

"one characteristic of markets is that they tend to emphasise short-term rather than long-term interests. Even where the governments have few op-

tions, they will not automatically look towards a long-term commitment such

*Nucleocrats keep insisting that their's is a "mature technology" in today's competitive world*

*"As soon as you say your technobgy is mature, you're in the first stage of dying"*

as a nuclear plant as a solution."

The consensus working group paper on reactor strategies forecast that by 2040, between 10 and 15 GW of fast breeder capacity will have become operational. A separate French-Japanese-Russian paper on the global fast reactor outlook concluded that "fast reactors have demonstrated satisfactory performance over 45 years from the standpoint of reliability and safety, thus confirming their maturity." However, one U.S. national laboratory official commented that for units large enough to contribute significantly to future electricity production, "That statement just isn't true. He noted that operation of Superphenix in France has been beset with bureaucratic delays and technical problems, while the timetable for the restart of Monju in Japan is in doubt.

Mark Hibbs

*Nucleonics Week June 19, 1997*





# Fly Now! Pay Throughout Your Life

On May 2 the passenger flight KL 129 of Royal Dutch Airlines (KLM) transported a package of radioactive medical equipment that was not checked sufficiently for radiation. Since February the producer of the Technetium-99 diagnostic source, Malinckrodt Medical in The Netherlands, had worked with defective radiation monitors. Royal Dutch Airlines was reproached that it transported the source unchecked, did not inform authorities

## The Bomb Under Your Seat

The flight in question was a short hop from Amsterdam to London. What about the long intercontinental flights lasting eight hours or more. A package emitting radioactivity allowed under the rules could still make you into an involuntary nuclear worker! Whom do the rules protect? The manufacturers and the airline would both claim that they were "well within internationally accepted standards" and anyway you were subject to much greater risk just crossing the street. There is also the question of the safety of the airline crews and airport package handling staff. These things can be sitting unclaimed for months dousing unsuspecting staff with their deadly rays.

and failed to inform the 115 passengers. During judicial investigations into the incident, KLM announced it would no longer transport radioactive material in passenger flights.

The Observer of June 22 uncovered the story. According to international transportation rules, the outside radiation limits of a package may not exceed 200 millirems an hour. The high levels on the Technetium-99 source

were discovered after some weeks by a Heathrow airport (UK) employee. Radiation levels were more than 1000 millirems an hour. Malinckrodt Medical said there was contamination of radioactivity outside the lead container on a needle on top of it. This should have been checked at the Malinckrodt factory but remained uncovered due to a defective radiation monitor. Since February, employees found strange results from the equipment but no remedial measures were taken. According to officials, a passenger right above the package could have received about 150 millirems of radiation during the flight. 'Acceptable' radiation dose for the general public is 100 millirem a year.

After the publication by the Observer several authorities started investigations. According to the Dutch Traffic Inspection (RVI) both KLM and Malinckrodt violated the law regarding transportation of dangerous goods. KLM was especially reproached for not informing government authorities after the discovery at Heathrow. They were only informed by British authorities on May 23. RVI passed the case to the office of public prosecutor for prosecution. KLM fears a suspended withdrawal of permission to transport radioactive goods as penalty. Some passengers started a case to get financial compensation for future health consequences.

On June 27 another package from Malinckrodt was found at the Schiphol airport with radiation levels higher than permitted. The package was not put on a plane as it arrived too late. It was sent back to Malinckrodt. After this new incident, KLM announced it would also stop transporting radioactive materials in cargo planes during further investigations. Authorities withdrew the transport license of Malinckrodt for a few days. On June

## Letterbox

*Continued from page 2*

*However, Minatom, the Russian Ministry of nuclear power is planning the construction of ten new reactors by 2005. Russia is even trying to attract foreign investment in the reactor projects. The Russians admit that unless they improve the industry, a decade from now, the nuclear industry would be in a poor shape. More orders and more money is what is required. The nuclear scientists are happy that there are still countries like India and China and some other third world countries which need huge power and are willing to place order for nuclear reactors.*

And these are the guys who are supposed to be providing finances for the Koodankulam reactors!

I am also curious about the exact cost of the project - the numbers reported in the Indian media vary from Rs 14000 crores to Rs 17000 crores, a variation of about 20% and when considering projects of this magnitude, this can be significant. Not that one takes these official numbers too seriously, given the track record of delays and over-runs of other reactor constructions. And, one expects that these numbers don't take into account other costs - for example, the cost of training Indian scientists, as mentioned by the Secretary of the AEC. I look forward to future issues of Anumukti.

*M. V. Ramana MIT Cambridge, Massachusetts USA*

30 the license was renewed, adding more safety requirements. However, KLM still refuses to send packages from Malinckrodt while the investigations are still going on.

*Sources: WISE Communiqué 475*

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# *Fast Breeder Reactors: The Dream Gone Sour*

Nuclear energy is a dream which over time turned into nightmare. Nothing illustrates this better than the sorry saga of the breeder.

Nucleocrats have always claimed that nuclear energy is an inexhaustible source of power for the future. At the bottom of those large multi-coloured glossy posters are some astronomical numbers sure to dazzle the lay public. One kilogram of uranium gives energy equivalent to two million kilograms of coal! And so on and so forth... That is the dream of the fast breeder.

99.27 % of the naturally occurring uranium consists of the isotope uranium-238 which is non-fissile. Only 0.72 % of naturally found uranium consists of the fissile uranium-235. Thus most of the uranium recovered after so much trouble of mining and milling is of no direct use in the production of electricity. Its only use is in making bullets and armour piercing shells which vaporise on impact and cause untold misery not only on the enemy but also one's own troops who might inhale the resultant dust. However, the breeder is an arrangement where this non-fissile uranium 238 can be converted into plutonium which is again fissile and thus can be used in producing electricity or making bombs. A proper arrangement can lead to a situation where the reactor produces (breeds) more fuel than it consumes. The fast in fast breeder refers to the speed of the neutrons which cause the fission to occur. In normal (thermal) reactors, neutrons need to be slowed down (moderated) in order for the chain reaction to proceed. The fast has nothing to do with the speed of breeding which is in fact quite slow.

Once the plutonium has been produced in a reactor it needs to be separated from the rest of the spent fuel junk in a reprocessing plant. Thus, the viability of a nuclear electricity pro-

gramme based on breeders, depends not only upon the amount of breeding in the reactor but also on the efficiency of reprocessing.

From the beginning the very rationale of the Indian nuclear programme has been a successful breeder. This is because despite a lot of exploratory efforts, the country's uranium reserves are small and of very poor quality. Whereas, India has the world's largest deposits of thorium. Thorium just like uranium-238 is by itself not fissile but can be converted to fissile uranium-233 under intense bombardment by neutrons in a fast breeder. Thus for the Indian nuclear programme to be of any relevance to meet the country's electricity needs, success of fast breeders and reprocessing technology is a prerequisite.

In the early days of the nuclear dream, all nuclear establishments all over the world were of one mind regarding the course to follow. All roads led to the breeder.

However, with passage of time and wisdom having dawned through experience, many countries decided to opt out of the breeder. The reasons for this bout of revisionism were the following:

- Unlike in India uranium in other parts of the world turned out on further exploration to be far more plentiful than early fears had indicated. Thus, fears regarding shortages of supply of uranium receded further and further.
- This had adverse effect on the economics of the fast breeders since their economic viability was postulated on high uranium prices. The cost of electricity produced in fast breeders turned out to be three times more expensive than the already

costly nuclear electricity. In a competitive world breeders became an idea with an ever more distant bright future.

■ While small laboratory scale plants were successful in operation, scaling them up to large industrial scale units proved to be far more difficult than envisaged. The history of the Superphenix, the first of such efforts is a vivid demonstration of the old axiom of there being many a slip between the cup and the lip.

While plutonium is produced in both thermal and fast breeder reactors, its quality is vastly different. Fast breeders produce weapons grade plutonium (in fact this fact was the very source of their attraction to countries where the "peaceful" atom did not mind prancing about in a war dance). But in other countries especially those like the US which had huge quantities of weapons grade plutonium already accumulated, the easy route to such plutonium by others was viewed with suspicion and weapon proliferation concerns became paramount.

As the dream started fading, only two countries with an obsessive concern regarding security of fuel supply still stuck to it, France and Japan. The French decision after Herculean efforts to throw in the towel leaves Japan alone as a country with serious plans for future FBR construction. The Japanese breeder record is also nothing to write home about as well. The 300-MW demonstration breeder Monju was closed after a sodium fire in December 1995 and has been dormant ever since. Once the cornerstone of the Japanese nuclear program, Monju is now symbolic of a Japanese nuclear identity crisis.



That leaves the field wide open with only Russia and India still abiding by the old faith. Although Indian nuclear programme can't do without the breeder nobody in the world considers India to be a serious player since the Indian nuclear establishment has not shown any initiative to do anything truly innovative during the last almost fifty years of its existence. Also it's record in running a small 14 MW Fast Breeder Test Reactor (See adjoining article) has been anything but inspiring. There is also Kazakhstan which has a 150 MW breeder in operation since 1973, but then Kazakhstan's technological prowess are in a class even more exalted than that of India.

The position of Russia is different from all the rest. First, they have large supplies of other fuels and are not really dependent on breeder. They have demonstrated undoubted technological skills. However, their record regarding nuclear technology has been truly world shattering with names like Chernobyl and Kyshtym and Techa river etched on for ever. But luckily they have no money to pursue this or any other dream. May be their dream is that if they show enough interest and some progress, others would pay them not to pursue this dream.

Surendra Gadekar

Sources: Based on material from WISE News Communique 475

Fast Breeders Presently in Operation			
COUNTRY	NAME	POWER (MW)	START - UP
India	FBTR	14	1985
Kazakhstan	BN-350	150	1973
Russia	Bjelojarsk 3	600	1981
France*	Phenix	250	1974
Japan*	Monju	300	1995
* Status uncertain: not closed, not functioning			

Fast Breeders Permanently Shutdown				
started	Closed	NAME	COUNTRY	
		POWER (MW)		
1949	1952	Clementine	USA	0,025 th
1956	1957	BR-2	RUSSIA	0,1
1954	1959	BR-5	RUSSIA	
1951	1963	EBR-1	USA	
1961	1965	Lampre	USA	1 th
1966	1972	Fermi-1	USA	66
1969	1972	sefor	USA	20 th
1962	1977	DFR	UK	
1975	1994	PFR	UK	
1967	1982	Rapsodie	FRANCE	40 th
never	1983	Clinch River	USA	280
1988	1988	PEC	ITALY	120
1977	1988	KNK II	Germany	20/100th
never	1991	Kalkar	Germany	346
1965	1995	EBR 2	USA	20
1985	1997	Superphenix	FRANCE	1240
th stands for thermal output which is usually one fourth of the electrical output				

FBTR: Designedly 14 MW finally joins the grid after 12years at 1 MW (Applause)

India V fist Fast Breeder Test Reactor (FBTR) at Kalpakkam is operating at a slightly higher output than previously, but the unit is not breeding and has just started producing electricity, joining the grid at a rated output of 1 MWe.

A single spent Fuel subassembly has been removed from the first core and subjected to post-irradiation tests in hot cells, officials said. The irradiated subassembly, and two more still in the core, will be reprocessed when a pilot chemical separation line for FBTR fuel is operating, anticipated in 1999.

FBTR is designed to run at an output of 42.5 MW (thermal), and now operating at 12.5 MWt, officials said. After years of delays, the unit went critical in 1985 but, as of 1993, never operated at a power level above 10 MWt (NW, 13 May 93, 17). Officials said last month that the breeding ratio of FBTR is less than one, and that the reactor is not producing electricity.

According to Indian officials, the Department of Atomic Energy (DAE) and the Indira Gandhi Centre for Atomic Research in Kalpakkam, which operates FBTR, are constructing a pilot facility to reprocess some spent fuel from the reactor. Officials said they anticipated that, provided financing is forthcoming, the breeder fuel reprocessing line may be finished in 1999. The officials said the pilot plant is being built adjacent to a completed commercial spent fuel reprocessing plant for PHWR fuel at Kalpakkam, and that the two plants may share some common facilities. Equipment for the breeder fuel reprocessing line is designed and built in India, these sources said; materials and mechanical testing has revealed no apparent problems.

The design throughput of the pilot breeder fuel reprocessing line will be "very small," one official stressed, since the purpose of the project is to demonstrate the technology by reprocessing a handful of FBTR subassemblies. The DAE plans to build a larger reprocessing facility to accompany a 500-MW fast breeder which is still on the drawing board. By the time the pilot reprocessing line for FBTR is ready to operate, they said, it is anticipated that at least two more irradiated subassemblies, in the reactor's first core after 12 years of operation, will be removed.

Mark Hibbs, Nucleonics Week July 10, 1997,

## *SUPERPHENIX Dies A Premature But Well Deserved Death*

Superphenix, the first commercial and largest Fast Breeder Reactor in the world, will be closed this year and not in 2020 as originally planned. The new Socialist Prime Minister Jospin announced the closure on June 19. Dominique Voynet, the new minister of environment, from the Green Party, confirmed the government's decision to shut it down. The government will take six months to work out the technical details of the closure and to discuss it with its foreign partners.

The sorry history of the Superphenix plant began in 1974 with the founding of NERSA, the European Nuclear Society for Fast Breeders. Partners were: the French EdF with 51%; the Italian ENEL, 33% and the SBK consortium, 16% (made up by the German RWE, the Belgian Electrabel and the Dutch SEP). Its starting capital was French Francs (FFr) 6 billion. Construction of the Superphenix started in 1975. It went into operation in 1986, but was plagued by many accidents and unusual incidents and only operated an equivalent of 9 months (278 days) full-power during the whole 11 years. June 19, 1997 the day when its closure was announced marked the 4000th day of shutdown.

In 1994, after a variety of problems which continued to plague the plant it was decided to refashion the Superphenix from a breeder into a burner of plutonium. Instead of being primarily a producer of electricity it acquired a new role as a research tool. On September 15, 1995, the foreign partners agreed to remain in NERSA and carry their share of the operating costs until December 31, 2000, in exchange for electricity deliveries from the reactor. EdF agreed to pay for the research program.

Superphenix was closed temporarily on December 24, 1996, for repair, maintenance and reconstruction and it was planned for restart in June 1997. It lost its license in February 1997 (see "Upsurge of Revisionism Regarding the French Nuclear Success in *Anumukti* Volume 10 Number 1) and would technically not be ready for restart until this fall. The former government intended to give it a new license without a new public inquiry, but the elections came in between.

Superphenix employs 700 persons besides indirectly supporting another 2500 jobs around a 30 km radius of the plant. NERSA pays FFr 127 million in salaries and contributes FFr 100 million in local taxes. Nearly 2000 people gathered to protest the plans of the new government to close the Superphenix.

There is some uncertainty on how much the shut down will cost. Some estimates put total costs of the Superphenix up till the year 2000 at FFr 60 billion (US\$10 billion). A study by the Ministry of Economy calculates the direct costs of closure at FFr 20.4 billion: 8.9 billion for paying the debts; 3 billion for closing it; 3 billion for reprocessing the spent fuel, and 5 billion for dismantling. The early closure this year instead of 2020 will add about another FFr 6 billion. The closure will cost EdF, as operator of the plant, several billions. The foreign partners will get compensation for the guaranteed deliveries of electricity through 2000 and could ask for compensation to recover damages for the early closure. A plan for decommissioning, job conversion and a new economic plan for the region has to be worked out.

There is strong opposition to the idea of the shut down among supporters of the plant. These include the energy branch of the CGT trade union, closely linked with the Communist Party, which is a partner in the ruling coalition. They warned that "no decision on closing Superphenix" can be taken without "a true democratic debate on the country's energy policy". The CGT has always strongly supported the breeder program. But now it is more concerned with the broader issues of employment and wages in the region and will not block the closure. Besides, according to *Le Monde*, dismantling will double the employment at Malville for the coming five to six years.

Europeans Against Superphenix, a confederation of 250 environmental and anti-nuclear groups, asked Minister Voynet on June 6, 1997, to "put an end to the biggest failure of the French nuclear power industry." They celebrated the decision to close Superphenix as a historic victory after more than 20 years of actions. The closure of the Superphenix means that the French breeder, plutonium recycle and actinide burning programs have all to be reviewed. It has still to be seen whether the plans from the new government for a 10 year moratorium for MOX production and use and a review of the reprocessing plant at La Hague, as laid down in the French Green/Socialist agreement of this spring, will be realised. If so, the complete French nuclear back-end policy has to be revised.

*Source WISE News Communiqué 475  
Europeans against Superphenix,  
9, rue Dumenge, 69004 Lyon,  
France*



# ASKING NUCLEAR QUESTIONS

**I**n a survey of public opinion by Gallup Pakistan, when asked "in your view should Pakistan build or not build nuclear weapons", more than 80% said yes, Pakistan should build nuclear weapons. This overwhelming support for having nuclear weapons goes hand in hand with a widespread fear. Two-thirds of those interviewed expressed fears that war with India may soon break out, and more than half thought that this war would be a nuclear war. All this comes as no real surprise. For most people these questions were asked as if they had no connections and no consequences. They answered them, on the basis on an idea, perhaps no more than a feeling, that nuclear weapons would somehow protect them.

It would be worth going to each of the 1,000 households whose opinions were sought and asking them if they knew what a nuclear weapon was. Did they know what it would do if it exploded? Did they understand the way in which it was supposed to be a defence? Had they any idea about why in the Cold War between the US and USSR both sides had tens of thousands of nuclear weapons and yet still felt unsafe?

Did this 80 per cent, and more, who want the bomb ever think about the possibility that having nuclear weapons might actually make war more likely<sup>0</sup>

Nuclear weapons raise the stakes in conflicts between states. This is supposed to be their job. It is the mechanism through which they create deterrence. It is the threat of escalating a conflict to a nuclear level, a level of such destructiveness that war becomes unthinkable, that is meant to stop war starting in the first place. But this solution to the question of whether to go to war or not only makes sense in a

world of rational calculation, of states knowing what their interests are, and being able to judge them precisely. Real states are not rational, they have other interests than war and peace, and nuclear weapons increase the space that states have for pursuing these interests.

What nuclear weapons do in this situation can be seen from the Cuban example. To the Russians, Cuba was theirs, ideologically. The Cuban people had fought a revolutionary war against a tyrannical government, a government backed by the United States of America. The revolution had been the choice the Cubans had made.

For the Americans, Cuba was theirs by virtue of history and geography. It had been an American backyard.. World War III, a real war to end all wars, perhaps even the end of the human race, could have started because the Soviets wanted to deploy nuclear weapons in Cuba, to counter the American nuclear weapons in countries bordering the Soviet Union. If the Soviets hadn't made a fuss about the American weapons, why should the US make a fuss about Soviet weapons?

The Soviets had miscalculated. The US did make a fuss. They demanded the Soviets withdraw. Then it became a matter of Soviet and American pride. The deadly combination of nuclear weapons, ballistic missiles and a tiny island in the middle of the nowhere that both sides felt belonged to them, but was not actually vital to either of them. And it was the nuclear weapons that mattered. Without nuclear weapons, the Russians in Cuba posed no threat to the US. With nuclear weapons, the threat was taken to be mortal.

India and Pakistan both have nuclear weapons of sorts and they also have their Cuba. It is called Kashmir.

The similarities may not be exact but they are significant nonetheless. The interests clash and the battle is fought out behind the shelter of the belief that there will not be a real war. The Indian state seems prepared to go to any lengths to keep Kashmir. The number of troops deployed there and the brutality that they are prepared to use are clear indicators of that. Pakistan, sheltering behind its nuclear weapons, has become determined to use Kashmir to even old scores.

It is not surprising then that most of the 80% or so of Pakistanis who want the Bomb also fear India. And so they should. The two are connected. Neither side may want to go to war but as recent events have shown things quickly get out of hand. A rocket attack led to more casualties than expected. It exploded into several days of shelling across the border but then the situation calmed. Suppose it hadn't. Suppose that the casualties had mounted, and Indian helicopters patrolling the Line of Control had been shot down. [Suppose..](#) It is easy to write such scenarios. How far out of hand they get can be judged from an Indian opinion poll carried out last year, thirty-three percent of the people questioned said India would be justified in using nuclear weapons if Pakistan were about to take Kashmir. These were people who had thought at least that far.

Like their Indian counterparts, the Pakistanis who expressed their opinion that the war would become nuclear, were drawn from the group that thinks their country should have nuclear weapons. These are people by and large, in the famous words of General Sherman, "who have neither fired a shot nor heard the shrieks and groans of the wounded, who cry aloud for blood, more vengeance, more desolation." For those who know about war.

Sherman said, "war is hell." Nuclear war goes so far beyond Sherman's experience of fighting in the American Civil War, that to call it hell is to understate the horror.

Perhaps the question should be asked again of the 65% of Pakistani people who fear war between India and Pakistan, and the 56% who expect it to be nuclear war, whether they still want nuclear weapons but this time after they have been shown videos of Hiroshima and Nagasaki. It would be interesting to know how many of them

living in Islamabad, for example, still think Pakistan should build nuclear weapons when they are told what would happen if there were to be a single nuclear explosion over their city.

The choice of example is not without significance. Hiroshima, like Islamabad, sits at the bottom of an arc of hills and had about 300,000 people. A simple nuclear weapon, the kind that India and Pakistan have, killed 200,000 of them. To help the people of Islamabad, most of whom are involved in the business of running this

country, think about this issue in strategic as well as in personal human terms, perhaps they should be asked: given that a nuclear war is more likely to be started by Pakistan (since it has a much smaller army and is likely to lose a conventional war), and given that India is likely to retaliate to a nuclear attack of its own, and given that a nuclear weapon could kill two of the every three people in Islamabad, do you think Pakistan should pursue its nuclear weapons programme?

*Dr. Zia Mian*

## *A FISSILE MATERIAL CUT-OFF TREATY*

**T**he spectre of nuclear weapons continues to haunt our world. A Fissile Material Production Cut-off Convention is on the anvil. The aim of this treaty is to prohibit production of fissile material for weapons production.

All nuclear weapons require fissionable raw material - highly enriched uranium (HEU) or plutonium. Since neither of these are found in nature, extensive processing facilities are needed in order to produce these. Thus a natural route to cap the world's nuclear arsenal is to control or stop the production of these materials for use in weapons. Control strategies, however, are complicated by the fact that enriched uranium and plutonium can also be used for non-weapon purposes, especially as fuel for nuclear reactors.

The present approach has been to allow the production and use of fissile material but to monitor (or "safeguard") its use by verifying that it is not diverted to making nuclear weapons. This strategy is applied presently only to those countries that possess and use fissile material and that have signed the Nuclear Non-proliferation Treaty (NPT) as non-weapon states.

### *HISTORY*

A production cut-off was first proposed by USA in 1956. The USSR rejected this proposal. In 1989, President Gorbachev of the Soviet Union agreed to a cut-off in production, but the Bush administration in the USA was opposed to it. The recent interest in the cut-off arises from the situation that all the nuclear weapons powers feel that they have already accumulated enough for future needs and want to prevent threshold states like India and Pakistan from doing the same.

The UN General Assembly passed resolution 48/75 which "Calls upon all States to demonstrate their commitment to the objectives of a non-discriminatory, multilateral and internationally effectively verifiable treaty banning the production of fissile material for nuclear weapons or other nuclear explosive devices".

### *SCOPE*

A cut-off treaty would allow states which already have stocks of unsafeguarded fissile material to maintain them outside of international safeguards, but would allow the future production of fissile material only if the material is safeguarded. While the convention will be open to all coun-

tries for signature, the states that have already signed the Nuclear Non-proliferation Treaty (NPT) as non-nuclear weapon states are already subject to all the provisions of a fissile cut-off. Thus the primary goal of the convention will be to attain the signatures of the five declared nuclear weapon states (China, France, Russia, the United Kingdom and the United States) and the three undeclared states (India, Israel and Pakistan).

A fissile cut-off would reduce the discriminatory nature of the existing non-proliferation regime by being equally applicable to both the nuclear weapon states as well as the undeclared states. The weapons states however do not want a fissile cut-off convention to include existing stocks. Thus even though the cut-off would be non-discriminatory in how it applies to different countries, its effects on the different signatories would be highly discriminatory.

### *IMPLICATIONS*

A production cut-off would have few immediate implications for the USA and Russia. Both countries have huge stocks of fissile material and have already stopped producing further amounts. In fact, their problem has been what to do with the huge surplus.



Britain is not believed to have produced weapons grade uranium since 1963, in part because it was able to acquire HEU from the United States. It is also not believed to be producing any plutonium currently. However since its military stocks of fissile material are relatively small, a production cut-off would place reasonably strict limits on the size of its future arsenal.

France is not currently believed to be producing fissile material for weapons. However France does not make a clear distinction between civil and military materials and has reportedly used plutonium produced in power reactors to make nuclear weapons. Given the size of its stockpile, a cut-off would have little immediate impact on its nuclear-weapon program.

China is reported to have stopped producing HEU and plutonium for weapons. Because there is much uncertainty about the size of its nuclear arsenal and its past production, the size of its military stockpiles is unknown and thus the implications of a cut-off are not clear.

It is the undeclared states (India, Israel and Pakistan) for which there is much uncertainty in the implications of a cut-off. Since these are believed to have relatively small stocks, a cut-off would affect them most dramatically.

## VERIFICATION

Verification is complicated by the fact that for many of the signatories of a cut-off numerous previously unsafeguarded facilities will continue to operate under a cut-off.

The core set of facilities targeted for verification would include those which produce or have, in the past, produced, HEU or plutonium for weapons. This could be widened to include operating or shut-down plutonium production reactors as well as civil nuclear facilities. The scale of a verification scheme that includes all

these can be realised by noting that the United States alone has about 300 facilities which might be subjected to safeguards. An even broader system could include measures to detect clandestine fissile production.

Difficulties of verification would be compounded in countries which actually wanted to hide information from inspectors. Some of the methods suggested to overcome reluctance to disclose information are remote sensing from satellites and aircrafts, environmental sampling of air, water or soil in the vicinity of the site and independent verifications of material accounting data.

There is general agreement that the principal verifying agent of a multilateral cut-off treaty should be the International Atomic Energy Agency (IAEA) which already conducts such verification for all non-weapons signatories of the NPT. Moreover, the IAEA has significant experience applying safeguards in a variety of situations. This would mean an increase in the workload, and thus, the budget of the IAEA. It may also take time to train additional IAEA inspectors and otherwise prepare to fully implement safeguards. As a result, the convention could specify that the verification provisions be phased over a period of a few years, beginning with the core facilities.

## CONCLUSION

A fissile cut-off is central to the future of nuclear arms control and provides the only way to cap nuclear arsenals. This is, of course, only the first step, since a cut-off treaty would still leave states with unsafeguarded material that can be used for weapons. However this is a necessary first step, and, in view of the dangers of stockpiling and proliferation, it is urgent.

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(This is an edited version of an article which first appeared in  
Peace Magazine, Toronto)*

# The Hawks Soar High

## Indian Position on the Nuclear Issue

Prime Minister I. K. Gujral on May 31st said that India will not sign the fissile material cut-off treaty (FMCT). In a speech at the Bhabha Atomic Research Centre, he said, "Earlier we did not sign the nuclear non-proliferation Treaty (NPT) and the CTBT in spite of pressure by power blocks. Their stand on fissile material cut-off treaty will also be dealt in a similar manner

A more nuanced version of the "official position" on the fissban and on other issues is often found at forums like the Conference on Disarmament (CD) and international conferences. For example, speaking at a recent conference in Washington, Ambassador Prakash Shah said, "When we became the lead sponsors of the UN General Assembly Resolution on FMCT in 1995, we had envisioned it within the overall context of nuclear disarmament. We remain convinced that if FMCT has any value, it has to be part and parcel of a negotiated, phased programme for the elimination of nuclear weapons.

### *So, is that the final position?*

Despite this seemingly defiant posture, there are some signs of flexibility. For example, in response to charges of inflexibility, Indian officials usually point out that the "time" in the time-bound process is negotiable. A more substantial case of flexibility is to be found in the Indian position on the inclusion of existing stocks into fissban negotiations. The nature of the Indian nuclear strategy, to the extent there is one, is based on ambiguity about the extent of their fissile material stocks. Thus, traditionally, together with the five nuclear weapon states (P-5) and Israel, India had argued against the inclusion of stocks in the proposed basic FMCT.

On the other hand, in the domestic debate, the last few years have seen what seems to be a hardening of postures and an increased legitimisation of the idea that India should "exercise" its nuclear option, or be prepared to do so at short notice.



## Drifting into Deterrence

missile programmes, especially the intermediate-range Agni, is among the suggested preparations. A more recent public action along these lines has been the movement of India's short-range Prithvi missiles to Jullundhar.

Ever since the early sixties, sections of the Indian policy-making community have advocated building a nuclear arsenal. However, their influence has been relatively marginal, as evidenced by India's refusal to go overtly nuclear and not conducting any nuclear tests after 1974. The first indications of a shift in the balance were seen during the period before and after the indefinite extension of the NPT in 1995.

The arguments used by the bomb lobby have been broadly the following:

- Nuclear disarmament is just a pipe dream; India's moral position made sense in the past when India's nuclear capabilities were more limited. Nuclear weapons are here to stay and hence India should go about building its own nuclear arsenal.
- The fissban, like the CTBT, is a continuation of the hegemony of the P-5, and, as with the CTBT, India should oppose this treaty.
- The fissban does not reduce security threats to India in any way, but constrains India's responses and its nuclear option significantly.
- The verification of the fissban, unlike the CTBT, would involve intrusive safeguards at indigenously-constructed nuclear reactors and other facilities.

It appears that with each round of negotiations in international nuclear arms control the Indian bomb lobby has become more powerful. For the hawks, the rationale for the linkage

between a time-bound nuclear disarmament process and the fissban or the CTBT is two-fold. First, it buys time so that the internal debates can be fought out and some consensus for further nuclear weapons development reached. The second rationale is that this linkage is needed to gain credibility among the majority of India's urban elite who support India's official position that India should keep its options open only as long as the other states are not willing to give up their arsenals. Indeed, there is still overwhelming support for India being part of global nuclear disarmament. A recent poll conducted by the Kroc Institute and the Fourth Freedom Forum, found that 83% of those polled supported an international agreement for the elimination of all nuclear weapons.

In addition to the public postures of the government officials, there is another point of view that is expressed behind closed doors. While the crescendo about fissban has been building up in the Indian media, several Indian policy-makers have been quietly talking, informally, about trying to make a deal with the United States about the nuclear question. According to these people, India would be quite willing to sign the fissban - but for a price. What exactly the price is has never been stated explicitly, but most of the proposals focus around nuclear and space technology.

This reflects the view that through its actions at the CTBT negotiations, India has proved capable of playing hard ball with the great powers, and the time has now come for the West, especially the United States, to recognise that India is a trustworthy nuclear state whose regional interests need to be accommodated. It is suggested that in return for this acceptance, India is prepared to abide by some limitations on its nuclear programs - not due to arm-twisting by the P-5, but because it is a responsible player. As in the case of the P-5 who, after having developed the requisite capabilities, embraced

arms control as an extension of their security policies, India, in the view of the hawks, may be beginning to see itself as "arriving," if not as having "arrived," and so may be considering arms control negotiations in this new light. However, the price the hawks would like to extract for any Indian participation in the international arms control process is a greater legitimisation of the Indian nuclear and missile prowess and bargains that would enhance the technical capabilities and domestic position of the nuclear and space departments.

In all these debates, the voices of the doves are seldom heard. One of the important reasons for their getting marginalised is the continued resistance of the P-5 to even consider a time-bound disarmament process.

Like any other state where no single group has a monopoly on national policy-making, what India will do at the fissban negotiations or elsewhere is determined by domestic politics and the influence of different groups within the country. With the hawks on the rise, in part due to the policies of the P-5, in order that there be some positive developments, there is a special responsibility for the P-5. They have to dramatically reduce the sizes of their nuclear arsenals, along with adopting other measures that de-emphasise the role of nuclear weapons, such as de-mating warheads from missiles.

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MIT, Cambridge, USA  
(This is an edited version of an  
article which first appeared in  
INESAP Journal)*



## Costs Blast Off On Underground Tests

The price of a pair of controversial underground nuclear blasts has more than doubled over original estimates, according to information supplied on June 30 by the US Department of Energy (DOE). Both tests - the first was held July 2 - are to be conducted at the Nevada Test Site near Las Vegas by the nation's nuclear weapons labs. Top-ranking DOE and lab officials have repeatedly estimated the cost of the so-called subcritical experiments at \$15 million to \$20 million each. The tests are designed to shock radioactive plutonium with a high-explosive detonation without producing a nuclear chain reaction. But the DOE, which funds the labs, revealed test preparations have already cost between \$77-\$100 million without any tests taking place.

The first blast, code-named Rebound, occurred more than a year after its original planned date. The DOE has said it delayed the tests to finish an analysis of future uses for the test site. But critics claim the DOE held off to avoid complicating negotiations underway last summer concerning a global ban on full-scale nuclear tests, the CTBT.

"The first tests are significantly more expensive than we expected, largely due to the increased time line," said DOE spokeswoman Carmen MacDougall. The DOE is asking for another \$70 million for fiscal 1998, which begins October 1, 1997, but a bill approved by the House last week forbids it from spending more on the experiments until DOE Secretary Pena submits a written report detailing 1996 and 1997 expenditures. MacDougall also blamed the high start-up costs to doing something new. The cost per test is expected to come down if the labs are allowed to conduct a series of blasts, as originally planned.

Paying so much for the tests is "grotesque", said Christopher Paine of the Natural Resources Defense Council (NRDC) in Washington. NRDC is the leading environmental group in a lawsuit filed in May 1997 that challenges the subcritical tests, among other DOE nuclear weapons programs collectively known as stockpile stewardship and management. "As a taxpayer, I'm outraged," said Livermore activist Marylia Kelley, president of Iri-Valley Citizens Against a Radioactive Environment, another plaintiff in the suit. The two subcritical tests are part of the DOE's 10-year \$40-billion nuclear weapons program. Preparations are moving ahead for Lawrence Livermore Laboratory to conduct the second test this fall, before the new fiscal year begins, but no date has been set.

### Actions

On the day of the first test, July 2, many actions were held. We will mention two of them. Three members of the Alliance of Atomic Veterans penetrated the DOE's security system. They went 40 miles (65 km) into the test site by mountain bike to the Low-Yield Nuclear Experiment Research (LYNER) Facility, hid under a trailer and waited for the count-down. Shortly after they were sighted and arrested. The action proved that deep penetration of a vital military installation is possible. A busload of 50 members of the international press heading into the Nevada test site was blocked by activists at the entrance of the test site. Three women dove under the bus and locked themselves with chains. The chains were cut and the women were removed by force and arrested. Four people blocking the bus were also arrested. All were fined. The actions got international and local media attention.

Contact: Tri-Valley CAREs, 5720 East Ave. #116, Livermore, CA 94550 USA.

## Can Alang Be Far Behind?

*There is a ship-breaking yard at Gadani in Baluchistan. Its counterpart in India is Alang near Bhavnagar on the coast of Gujarat. The folio wing report regarding the shocking goings-on at Gadani is a reminder to activists to investigate Alang as well*

**T**he Baluchistan High Court set up a seven member expert committee June 4 to investigate charges that radioactive waste and other hazardous materials were being dumped near the coast of Gadani where a ship salvage industry is flourishing. Press reports say old ships brought to Gadani for scrap carry hazardous material, which is dumped in Pakistan's territorial waters before the ship is taken ashore for salvage. A citizen petitioned the court to probe press reports that an ageing Japan registered ship bought by a Pakistani salvage firm had dumped 150 drums of radwaste last month. Pakistan has a 750 kilometre coastline and multinational companies have explored using some marshy wastelands for storage of hazardous waste. There have been frequent reports of the salvage industry dumping hazardous materials near Gadani, known as a ship "graveyard." *Nucleonics Week June 19, 1997*

## Stop Atomic Insanity



# *Solution Number 23 To The Nuclear Waste Problem*

## *Land Is Sprayed With Radioactive Fertiliser*

A uranium-processing plant is disposing of low-level radioactive waste by spraying it on 9,000 acres of company-owned grazing land. Three and a half years after the shutdown of the Sequoyah Fuels Uranium Processing facility, workers are still sprinkling its waste, diluted by rain, from a holding pond at the rate of 10 million gallons a year.

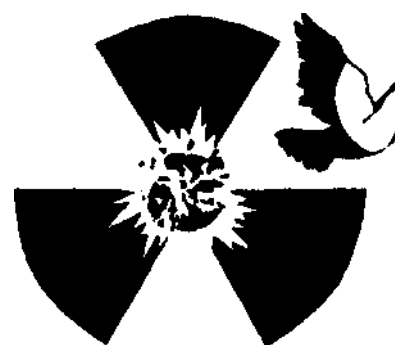
The 'fertiliser' is called Raffinate and is registered with the Oklahoma Department of Agriculture. State and federal officials approved the fertiliser plan in 1986. Raffinate, the main waste from a solvent used to extract uranium for nuclear-plant fuel, is slightly radioactive and contains 18 heavy metals. "We were screaming our heads off when all this was happening," says Kathy Carter-White, an attorney representing residents of the area. "But it was just like the powers-that-be were going forward. We just felt violated by what happened because the land will never recover."

John Ellis, Sequoyah Fuels president, said the company is piping the material to 75 acres of Bermuda grass where as many as 400 cattle graze. Some people blame the fertiliser for such mutations as a nine-legged frog and a two-nosed cow. They also say it could be a factor in some of

the 124 cases of cancer and birth defects counted in families living near the plant. There's no proof, though. "It's hard to separate out what damage came from the chimneys at Sequoyah Fuels and what was from the pallets on the ground and the groundwater and the land disposal," said Carter-White. "But the frog was found by a little boy at a country pond that was real close to where this surface application was taking place. The boy shot it and turned it over, and found it had legs sticking out all over its sternum." The big question is of course what happens with the beef of the cattle, or with the hay of the land. Already in 1987 Native Americans for a Clean Environment (NACE) claimed that hay was sold to American Indians. One shipment of hay was accepted (unaware of the possible dangers) by the Navajo Tribal Council. Sources: *Seattle Times*, 4 July 1997 / *NACE News*, May 1987 *WISE News* *Communique* 476

Contact: Nuclear Information and Resource Service, 1424 16th Street NW. Suite 404, Washington DC 20036, US.

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## *Early Morning Test Light over Nevada, 1955*

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of floating in the tropical,  
star-crossed water  
your mother carried under her heart  
that opens and closes  
like a butterfly.*

*when the sky flared,  
our room lit up. Cobwebs  
Sparkled on the walls, and a spider  
absorbed the light  
like a chameleon and began  
to inch forward the outer rings  
as if a fly trembled.  
  
Rooster crowed, The dog  
seratched at the door. I went outside  
hearing, the hens and thought  
weasel  
and found broken eggs, the chicks  
spongy, their eyes  
stunned and shrouded  
by thin vells of skin.*

*"Don't open your eyes."  
I whispered to you when darkness  
returned. I thought of your bones  
still a white gel, I remembered the story  
of blood of blood smeared on the doorways,  
and I placed my hand on the balloon  
you rode in-that would slowly sink  
to your birth. I Said  
the old German name your mother already picked  
for you, Robert. It means bright fame.*

**Robert Vasquez**

*A tomic Ghost: Poets Respond to the Nuclear Age.*

Dear Editor,

Last year, I worked for Friends of the Earth International on a safety analysis of the Rovno and Khmel'nitsky nuclear power plants in the Ukraine. These plants are VVER1000 plants - exactly the same kind of plant that the Indian government is negotiating to construct at Koodankulam. The safety analysis I did for these plants therefore has direct relevance for the Koodankulam project.

We found that a lot of questions are being asked about the safety of this type of nuclear plant. Yet the kinds of questions that are asked about the safety of this type of nuclear plant, though well-known in Europe, are not asked at all in India, and indeed, very little seems to be known at all about Russian-design nuclear plants, even amongst India's atomic establishment, which seems very happy to keep it that way.

Most of the problems with VVER 1000 safety are actually set down in a book published by the IAEA, called the 'Issues Book'. According to the Issues Book, these problems are:

- The possibility that the reactor pressure vessel may become brittle, due to the effect of neutrons on the steel. This would make it possible for it to crack violently open during an emergency, causing a major catastrophe with very large release of radiation. The government needs to ask very detailed questions about steel composition, welds, intensity of neutron flux, etc.
- The possibility that control rods may fail to insert properly during an emergency, preventing the reactor from shutting down. Failure to shut down could also

*Continued on page 16*

The fall of the Gujarat government is not an occasion for regret. Being a jellyfish is not a good recommendation for a Prime Ministerial candidate and Mr. Gujarat's conduct in high office proved a great disappointment to many who had expected far more from him.

There is no doubt that people in the country yearn for an honest and accountable government. The issue of stability is being played up as if a corrupt government which lasts its full course is a boon in itself. Have we forgotten Shri Narasimha Rao's government so soon! What does honesty and accountability mean? It certainly does not mean that one hides behind rules and does nothing. It also does not mean that no mistakes can be made. As long as there is full transparency in the process of the government, no secret deals are being made for private gain, I feel certain that the people of India will tolerate some amount of incompetence as long as it contributes to the learning process.

Shri Nabakrushna Choudhuri, who was chief minister of Orissa from 1949 to 1957, managed to run the government for seven years with a majority in vidhan sabha of only three! This was much before the days of the anti-defection law. Nowadays, this fact seems to belong to Ripley's Believe It Or Not. Perhaps in those early days of independence the representatives of the people had not developed a "conscience" and were hence saved from having to defect to serve the people.

In this *Anumukti* number, questions regarding these issues of accountability, transparency, democratic control keep cropping up. We learn (page 3) how the US government in the fifties and early sixties was so hellbent upon bomb production that they managed to seriously compromise the health of the very people the bombs were supposedly meant to protect! This massive assault, far more insidious and damaging in the long run than anything the Soviets could have launched was possible only because the US government despite its cacophony regarding freedom was not accountable to its citizens. The great delay in publishing the results of the study makes it apparent that the government even today is not willing to be held accountable for its actions in the nuclear field.

On page 8 we see that the Russians too are unwilling to have the truth come out regarding their nuclear skeletons and the lengths they go to suppress those who try to ferret it out. On page 15 we find the government of Bangladesh falling for the same old discredited arguments of the nuclear lobby.

Amidst all this, the decision of the Indian government and the nuclear establishment, to open up and allow international inspection of the Kakrapar site (page 5) might at first sight seem like a breath of fresh air. Has the leopard changed its spots? Or rather, as my daughter would put it has the twisted tail of the dog suddenly become straight? I recently met some workers from Kakrapar who told me how they were being coached on what to say in front of the team of international inspectors from WANO. Amongst the topics which were totally taboo was the damage caused by floods in 1994, and the fact that the Emergency Core Cooling System of unit-1 has never worked to design specifications. No wonder when this is what we mean by accountability and openness, the people want to try out a new set of rulers every opportunity they get.

*Surendra Gadekar*

## *Boom! Boom! Baby Boomers*

The years just after the second world war are known as the baby boom years since that was the time when a war weary generation decided to enjoy the fruits of peace. Recent evidence indicates that the name, for Americans at least, has a totally different and somewhat sinister connotation.

Ever since United States dropped the first atomic bombs on Hiroshima and Nagasaki in August 1945, there has been interest in the question of how the resulting gales of radiation and fallout affected those who survived. This question is of vital interest not only to the Hibakusha (the atomic bomb survivors) but to many other victims of the nuclear madness all over the world. Even after fifty years the question, does nuclear fallout cause an increase in ill-health among the exposed populations, still begs an unequivocal answer. In an age of the rapid advance of science, this uncertainty after decades of research on a question which affects the health of millions is incomprehensible, almost criminal.

The whole thing starts making sense only when we begin to examine the issue like any other criminal conspiracy; start looking for motives and opportunity. Who profits by this state of confusion? Who would be liable for damage to health and environment if an unequivocal connection could be proved? Who has the power to "halt the march of science"? The answer to all these questions is only one. It is the governments of the most powerful nations in the world who have had both the opportunity and the motive. It is they who made the bombs and tested them repeatedly in the atmosphere and underground, It is they who repeatedly assured their own populations that there **was** nothing to worry. And it is they who have stuck to a policy of stout denial in the face of mounting evidence.

One of the major reasons that governments can get away with their lies has been the fact that there have been very few proper studies of the exposed. Supposedly scientific studies have without any basis just assumed that a certain region like for instance North Utah had negligible fallout from nuclear testing and hence the people there could be used as controls. Since no measurements were made or if they were made, they were kept under wraps, studies made under such mistaken assumptions have never been convincing.

Contamination in some areas has been so large and its effects so stark, that despite all attempts by the government to deny any harm whatsoever, the people have just never believed the denials. American Ground Zero: The Secret Nuclear War by Carole Gallagher which was published in 1993 and has photographs and interviews of many of the victims is a detailed account of the life of ordinary people laid waste by the callousness of their own supposedly free and democratic government.

To put such a long ranging controversy at rest, the US Congress in 1980 passed a law (Public Law 97-414), which in part, directed the Secretary of Health and Human Services to "conduct scientific research and prepare analyses necessary to develop valid and credible methods to estimate the thyroid doses of Iodine-131 that were received by individuals from nuclear bomb fallout (and) to develop valid and credible assessments of the exposure to Iodine-131 that the American people received from the Nevada atmospheric nuclear bomb tests."

As part of fulfilling this mandate, National Cancer Institute (NCI) undertook a massive study beginning in 1980. In essence, the NCI study is the first time anyone has determined where the fallout landed and the degree to which people were exposed. As the chief investigator of the study. Bruce Wachholz said, "This is a crucial step in understanding the impact of the nuclear weapons tests on public health"

### *Effects of fallout often subtle*

Researchers know that in the aftermath

### *Knowledge Is Not Wisdom*

The Atomic Energy Commission (AEC) learned of the risks of fallout and the prevalence of hot spots with the first atomic test. Fallout was discovered 200 miles from the test site where "Trinity," the first nuclear bomb, was detonated in New Mexico in July 1945. The nuclear establishment also knew that a Western test site would spread contamination across most of the country. In 1948, well after the end of the Second World War, the committee assigned to choose a location was told by U S Air Force Meteorologist Col B G. Holzman that an East Coast site would be advisable "because the United States is predominantly under the influence of westerly winds." The committee intentionally chose a Western site because the weapons labs were nearby, which it felt would be helpful in "accelerating the pace of the weapons development program."

of a nuclear explosion, the gamma rays and neutrons that explode from an atomic fireball cause acute radiation sickness, burns, cancer, cataracts and some other diseases. These rays constitute just a small part of the fallout and cover a relatively limited distance. Their impact is dramatic and often immediate. The major part of the fallout is a mixture of all kinds of radio-



active fission products, and its effects can be more subtle. These radioactive poisons ride prevailing winds and can cover much of a continent. One of the many radioactive components of fallout is Iodine 131, which naturally concentrates in the human thyroid gland. The thyroid uses Iodine to make thyroxin and other hormones that regulate metabolism. The body is unable to distinguish between normal life-supporting Iodine and the radioactive poisonous Iodine. Children who do not get enough Iodine may not grow normally or fully develop mentally. Adults develop goitres: enlarged, overworked glands struggling to meet the body's demand for thyroid hormones.

#### *Study became political issue*

The National Cancer Institute study was essentially complete in 1994 and the full report is expected to be more than 100,000 pages. However, the institute showed some reluctance in releasing the results of the study. The study first became a political hot potato more than a year ago, when an advisory panel from the Centre for Disease Control requested a copy and was rebuffed. Some members of the advisory panel subsequently complained publicly that the institute was trying to suppress the data. "We are profoundly troubled by NCI's handling of this important study," said a letter issued by Physicians for Social Responsibility and the Military Production Network, a coalition of nuclear watchdog groups. "NCI officials have failed to release the material in their possession that would allow the public, health experts, policy makers and the media to begin assessing the impacts of these exposures." Tim Connor of the Energy Research Foundation and a member of the panel says, "To be sitting on this information, which shows where people are at risk, and to not be sharing that information with public health officials and others in a position . . . to mitigate those risks is unconscionable."

Wachholz said it simply took researchers a lot of time to interpret the voluminous material, draw conclusions and summarise findings.

Most scientists agree that the next step is to try to get a better handle on what connection, exists between Iodine 131 and thyroid cancer, and many activists already are calling for studies of the counties identified in the NCI report. "The whole population ... that was young or in utero for that period through 1962 needs to be studied," says Arjun Makhijani of the Institute

### *Lying Habits Die Hard*

*Estimates of thyroid doses, first reported in testimony to Congress in 1959 and still cited in 1997, range from 0.2 to 0.4 rad. But children on average actually received an estimated cumulative dose to the thyroid of 6 to 14 rad, and in the 24 most heavily contaminated counties, between 27 and 112 rad.*

for Energy and Environmental Research. "This issue is going to go on for a very, very long time."

Powerful governments have a vested interest in not letting the truth come out. Hence, it is no wonder that studies done so far on potential of radioactive Iodine to cause health problems have been both tantalising and frustrating in equal measure. Some researchers like David Becker, professor of radiology at New York Hospital/Cornell University Medical Centre, calls the association between Iodine 131 and thyroid cancer "weak."

The 1986 meltdown of the nuclear reactor in Chernobyl, presents a dramatic and tragic picture. Here the link between Iodine 131 and thyroid cancer seems obvious: More than 500

children have come down with the disease. Researchers are still trying to pin down the cancer-causing isotope and dose. However, the latest studies have been showing strong evidence of link between thyroid cancer and even fairly low levels of Iodine 131 exposure. A recent study by Elaine Ron et al. (Radiation Research, vol. 141, pp. 259-277, 1995) concludes that there is "convincing evidence" of increased thyroid cancer risk to children under 15 years whose thyroids are exposed to 10 rad or more.

The data, compiled by the National Cancer Institute, is the first to show high exposure rates outside Nevada and Utah. The new information is likely to set off calls for US federal compensation to some residents where the highest exposures are predicted. Some Utah residents have already been paid by the government for living in high-exposure zones; this study shows that thousands of residents of other states may have received the same exposure. NCI officials declined to discuss the report or the potential health effects of the fallout. But the highest average exposure in the hot spot counties — 16 rads for adults and up to 160 rads for children — far exceeds the 10-rad level at which the government recommends people be monitored by a doctor. The exposure rates for children are up to 10 times higher than the adult rate because radioactive Iodine was spread largely through contaminated milk, and children tend to drink more milk than adults and their thyroids are much smaller.

#### *Main findings*

More than a thousand nuclear tests were conducted by the US. Of these, just ninety released almost 99% of the total Iodine-131 entering the atmosphere at the Nevada Test Site (NTS). These ninety tests released about 130 million curies of Iodine-131, mainly in the years 1952, 1953, 1955, and 1957. This amount is enormous, approxi-





mately ten times the amount released from the 1986 Chernobyl accident, Some radiolodine was deposited everywhere in the United States, with the highest deposits immediately downwind of the NTS. The study shows that under today's federal limits, people in every county in the United States were exposed to too much Iodine 131. The lowest deposits were on the west coast, upwind of the NTS. In the eastern part of the country, most of the deposited Iodine-131 was associated with rain, while in the more arid west, dry deposition (where particles settle on the ground) prevailed. Because Iodine-131 decays with an 8-day half-life, exposure to the released Iodine-131 occurred primarily during the first two months following a test.

For most people, the major exposure route was the ingestion of cows' milk contaminated as the result of Iodine-131 deposited on pasture grasses; other exposure routes such as the inhalation of contaminated air and the ingestion of contaminated leafy vegetables, goats' milk, cottage cheese, and eggs also contributed. For individuals within a particular age range, milk consumption can vary substantially. For example, surveys have shown that 10% to 20% of children between ages 1 and 5 do not consume cows' milk. Their doses were only about one tenth of those received by children who consumed fresh cows' milk at average rates for their age. Conversely, the milk consumption of 5% to 10% of individuals in the same age range was two to three times greater than the average and their thyroid doses were therefore proportionally larger. The type of milk consumed also is important. It is estimated that at that time about 20,000 individuals in the U.S. population consumed goats' milk. Thyroid doses to those individuals could have been 10 to 20 times greater than those to other residents of the same county who were the same age and sex and drank the same

*The health of the photographic industry rated higher than the health of the people*

The first "Trinity" test also resulted in at least one hot spot in Indiana, over 1,000 miles away. One month after the test, the customers of the Eastman Kodak Company complained of buying fogged X-ray film. After an investigation, a physicist at Eastman Kodak determined that packing material that had been made from corn husks at a plant in Indiana had become radioactively contaminated. He deduced that the origin of the contamination was from an atomic explosion. The physicist's knowledge of the secret project was not altogether surprising the Kodak Company ran the Tennessee Eastman uranium processing plant at the Oak Ridge National Laboratory.

Kodak also reported problems from fallout after the first test in Nevada in January 1951, but this time they occurred as far away as company headquarters in Rochester, New York. After a snowstorm, Geiger counters at the Kodak plant showed readings 25 times above normal. When Kodak complained and threatened to sue, the Atomic Energy Commission agreed to give the company "advance information on future tests," including "expected distribution of radioactive material in order to anticipate local contamination."

In fact, the entire photographic film industry was warned about fallout. Throughout the atmospheric testing program, AEC officials gave the photographic industry maps and forecasts of potential contamination, as well as expected fallout distributions which enabled them to purchase uncontaminated materials and take other protective measures. The National Association of Photographic Manufacturers was also given some data on the nature of the test shots, "for their own information"

But the AEC did not see fit to provide milk producers or consumers with similar information, even when the significance of the milk pathway became clear

*Pat Orimeyer & Arjun Makhijani*  
*Bulletin of Atomic Scientists Nov/Dec 1997*

amount of cows' milk. Goats' milk concentrates Iodine-131 more than cows' milk.

#### *Beyond National Boundaries*

Additional cases would also occur in parts of Canada among children who were highly exposed at the time. Some people in northern Mexico also appear to have been exposed.

Further study will be needed to address the many uncertainties about the effects of thyroid irradiation. This study should focus especially on the hot spots to identify those most at risk. However, the need to address uncer-

tainties should not be occasion for delay in alleviation. There is ample evidence of risk and medical screening should be made available to all who were exposed as children

Since atmospheric nuclear testing has also been conducted by four other nuclear powers — the former Soviet Union, France, Britain, and China, these countries also need to make public all their data on fallout, and in particular on Iodine-131 releases.

*Surendra Gadekar*  
*Based on Pat Ortmeyer and Arjun Makhijani's article in Bulletin of Atomic Scientists and article in Washington Times*

# RAMIFICATIONS OF OPENING NUCLEAR POWER REACTORS TO INTERNATIONAL INSPECTION

By Vijai K Nair

**T**he announcement by the Indian Government to throw open two nuclear reactors at Kakrapar for international inspections is not really an earth shattering policy shift that it is made out to be. On the contrary it is a feeble announcement of no consequence. It does not affect either the national nuclear technology agenda nor by making this 'concession' do we in any way decrease the antipathy of nuclear suppliers and thereby facilitate the transfer of dual use technology to India.

## Status

As of date India has 10 operating power reactors; and 4 power reactors at different stages of construction. It is negotiating the construction of 2 power reactors with Russia; Besides it has a series of research reactors of which one is an operational Prototype Fast Breeder Reactor. Of these, only the units at Tarapur and Rajasthan are under bi-lateral safeguards administered by the International Atomic Energy Agency (IAEA). India has not ratified the IAEA Convention on Safety of Nuclear Plants, nor has it acceded to any of the international non-proliferation arrangements that would require it to throw open all its nuclear facilities to IAEA inspections.

## Objective of the policy shift

The stated aim of the policy shift to throw open the two power reactors at Kakrapar to outside safety experts is to mollify international concerns that India is operating reactors of unsafe design and to acquire feedback so that appropriate corrective actions can be taken to enhance safety.

## Verification versus Inspection.

The IAEA is authorised under its Statute to establish and administer safeguards designed to verify that nuclear material and other nuclear related items are not used to further any military purpose. It is important to note that the IAEA's safeguards system is distinct from its work in the area of nuclear safety. The IAEA carries out its 'verification activities under agreements made pursuant to a host of arms control agreements such as the NPT, CTBT, and established NWFZs which require each State Party to declare and submit to IAEA safeguards all the

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*Come one, Come All*

*Come and see Kakrapar;*

*We have nothing to hide*

*Except the floods, the fire and  
the untested falled*

*Emergency core cooling  
System*

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nuclear material under its jurisdiction or control for comprehensive safeguards. The IAEA also applies safeguards to nuclear materials in the five declared nuclear-weapon States under what are called "voluntary-offer agreements". In some States not party to the above instruments, the IAEA applies safeguards under agreements which specify, in addition to nuclear material, non-nuclear materials, facilities and equipment to be verified. As India has not acceded to any of

these arrangements, verification of its facilities to audit end use is not applicable.

## Selectivity, Safety and CBMs

The Government statement clearly defines the intent • inspections designed to provide greater transparency and generate domestic and international confidence in India's ability to create and efficiently manage nuclear power facilities. The stress is on safety and not verification of material utilisation.

It would allow inspectors to examine safety systems and devices, plant design and management techniques, operating procedures, waste disposal methods etc. of the selected nuclear power plants. All other nuclear facilities including research reactors, fast breeder reactors and reprocessing facilities are excluded from this offer.

Even in the designated facility inspectors would not have access to materials or records of materials. The disclaimer that all this would be effected outside the fold of the IAEA Convention on safety of nuclear plants suggests that while agreeing to inspections of selected nuclear facilities the actual protocol would have to be negotiated with the IAEA without compromising the existing national nuclear strategy.

Therefore, while acquiring a reasonably sound knowledge of the working of selected nuclear power reactors, thereby being able to interpolate material quantities, foreign inspectors would not be able to establish exact figures of materials in the cycle or their end use. Furthermore, since the facil-

ity thrown open to inspection is exclusively for power generation without any linkages to military programmes, external inspections would not compromise the nuclear option.

### *Global Non-proliferation*

#### *Im peratives*

The purpose of the established IAEA safeguard's is to gauge the extent of nuclear technical competence and to provide the technological trip wire to assess - if and when a state may develop nuclear weapons. The Indian nuclear weapon philosophy is predicated on a relatively limited weapons capability and does not imitate the deterrence philosophy in vogue in the West. It is in India's interest to keep the military and the civil nuclear technology separate. Therefore, placing these civil facilities under limited international inspection does not compromise national strategic imperatives and fails to assuage the primary concerns of the US and other countries' non-proliferation goals.

Technology requirements of the research reactors, components of the nuclear fuel cycle and the Fast Breeder Reactors have many things in common. Under these circumstances, the new policy would not, as seems to be the wish of our policy makers, slacken the technological noose instituted in 1974 to circumscribe development of India's nuclear technology.

The Indian offer to place power reactors open to international inspection will not generate the desired technological spin off. But it would,; to the extent of actual and still existant systemic failings, compromise the nuclear establishment and with it the development of strategic capabilities. It would heighten international interference in the national nuclear sector making for avoidable political ripples. Also it would increase the fiscal overload on an already meagre sectional budget by having to pay for inspection costs.

Undoubtedly peer review is a positive approach and can bring about the much needed element of accountability. There is phenomenal expertise available within the country which could be harnessed to improve questions of safety, optimisation of assets, and environmental degradation. This can only come about if reports of the Atomic Energy Regulatory Board are placed on public audit and debated openly in the Parliament. The intention should be to give impetus to the stagnant nuclear technology and power sector through greater transparency and accountability generated through domestic assets rather than offering cosmetic gestures to an international technology restrictive regime whose objective is to cap the Indian growth in this field.

Regrettably, the Government appears to have resorted to well established norms of announcing, what is termed as, fundamental policy changes, where in substance none really exist, thereby maintaining the status quo of mediocrity. Accountability starts at home before it can credibly be projected to others. Avoiding domestic transparency and accountability and offering vague and meagre concessions to the international nuclear community, no useful purpose is likely to be served.

#### *WANO -You Neve r Know*

Despite claiming that WANO's recent peer review of the Chernobyl nuclear power station had 'seriously misjudged' the situation, government inspectors have launched a safety review of the plant's only currently operational reactor, unit 3. The WANO review concluded that there were severe management and safety culture difficulties at the plant. The restart date for Chernobyl-3 has accordingly been put back a further 6 weeks from the planned date of 1 October Ukraine insists the WANO report is an attempt to force the unit to close without compensation.

(*Nucleonics Week. 25 September;*

## *Cat's Eyes or Bull's Eyes?*

### *IRRADIATED GEM STONES:*

#### *CARCINOGENIC JEWELRY FLOODS*

##### *ASIAN MARKETS*

The so-called "cat's-eye" stones are bombarded with neutrons in a nuclear reactor to change their colour from yellow to a dark brown. This makes them more valuable. A "normal" stone, for example, costs a few hundred dollars per carat whilst the dark brown ones are worth thousands per carat. Methods to change colour by irradiating the stones are legal. But afterwards they must be stored for about two years to let radioactivity decay to a normal level. In September the Bangkok Center for Gemstone Testing spread a preliminary warning because of abnormally high levels of radioactivity being found in the stones. They suppose the stones involved to have been distributed illegally by unscrupulous dealers who used irradiation for colour enhancement without storing them afterwards. The Bangkok center is saying that anybody who finds such a radioactive stone should store it in a lead lined container until the next century. But how do you find out if the cat's-eye you want to give your loved one for Christmas (or for some other reason) is radioactive? Never mind the fact that most people aren't privy to communiques from the Bangkok center. And where does one find lead lined containers, anyway? The source of the gem stones is still unknown. According to officials at Bangkok's Gemstone Testing Center several signs point to Indonesia. It is believed that low quality cat's-eyes from India have been exported to Indonesia to be irradiated there. Indonesia denies the accusations, claiming there is no way to perform the enhancement operations illegally. Thailand, India and Indonesia are now all accusing each other of being the country of origin for the stones. However, irradiating stones to change their colour is not limited to those countries; it is also done in other countries such as the Netherlands (for instance at the research reactor at the University of Delft).

Source: WISE-News Communique 482



# *The Police State Refuses To Wither Away*

## *The Kafkaesque World Of Aleksandr Nikitin*

Just in case anyone thought democracy and the rule of law were coming to Yeltsin's Russia, the country's security police in mid-June brought additional charges against nuclear safety campaigner Aleksandr Nikitin. International commentators have been solid in condemning the prosecution of the former naval captain for treason and espionage as absurd and unjust, and the case is being watched closely as an indicator of the state of human rights in Russia. Nevertheless, the General Prosecutor's Office has allowed investigations to continue, and the Federal Security Service (FSB) remains intent on bringing the case to trial. Over the past year, signs have emerged that officials at various levels of the Russian state are disgusted by the continued persecution of Nikitin. But the latest developments show that within the ruling apparatus, key decision-makers believe that arbitrary arrest and the denial of internationally accepted legal rights need to be preserved as a serious, ever-present threat to control government critics.

After quitting the navy in 1992, Nikitin worked in St. Petersburg as a researcher for the Norwegian environmental organisation Bellona. A specialist in nuclear submarine technology, he co-authored a Bellona report entitled *The Russian Northern Fleet: Sources of Radioactive Contamination*. Late in 1995 early drafts of this report began to seriously embarrass the Russian government, showing that in naval bases in the north of Russia, large quantities of nuclear waste were being kept in inadequate, decaying storage facilities. Bellona's employees and supporters in Russia began to suffer crude security force harassment.

By the time the final version of the report was released in April 1996, Nikitin was in jail - arrested the previous February 6 on preliminary charges of having revealed secret information. It was only in October that formal charges of treason, espionage and falsifying documents were filed by the FSB. By this time Nikitin had been adopted by Amnesty International as its first prisoner of conscience in post-Soviet Russia. The European Parliament and officials of the European Union issued strong statements in his support. One of the problems faced by the FSB in framing charges was that the supposedly secret information in the Bellona report was all freely available to any researcher with the patience to search it out. In the course of 1996, Bellona and its supporters showed this beyond doubt. "Nikitin and Bellona have demonstrated that all of the information they published was from open sources," the US State Department observed in a January 1997 country report on human rights.

Another problem was that under Russian law, the information arguably could not be secret. The Law on State Secrets adopted in 1993 states that no information on the conditions of the environment or on extraordinary incidents and catastrophes that endanger human life and health may be classified. The solution which the FSB found to this dilemma was Kafkaesque. Nikitin was deemed to have violated two secret Defence Department decrees, so secret that their contents could not be revealed even to his defence attorneys. These decrees had been adopted in 1993 and 1994. The fact that Nikitin—who had left the navy in 1992—could not have known of their existence was of no consideration. Neither was the fact that un-

der the Russian constitution, no one can be charged for violating acts of which they have not been duly informed.

After more than 10 months in prison, Nikitin was conditionally released on December 14, 1996 reportedly on the personal orders of General Prosecutor Yury Skuratov. Deputy General Prosecutor Mikhail Katyshev, who had been entrusted with examining the FSB's case against Nikitin, told the English-language Moscow Times on December 15 that in his view the case contained "no hint of espionage". "It is time for the prosecutor's office to admit that mistakes could have been made," Katyshev said. But Skuratov who, as the government's top legal official, had responsibility for deciding whether the prosecution should go ahead, did not order it dropped. Early in March 1997 the case was sent back to the FSB, with orders to tighten the allegations. For more than three months a renewed inquiry was conducted by a group of defence ministry officials approved by the FSB.

In April Nikitin was awarded the Goldman Environmental Prize. Meanwhile, the case grew steadily more notorious. On June 17 1997, Nikitin's lawyers were presented with a new set of charges. The defence ministry experts had decided that Nikitin had breached another secret decree. This one was dated from 1996 -after the Bellona report had been released. Reporting the response of Nikitin's lawyer to these developments, the Moscow daily *Nezavisimaya Gazeta* remarked on July 1: "In the view of the defenders, the situation more and more recalls the well-known fable about the

wolf and the lamb. Nikitin is guilty only of the fact that someone very much wants to eat him."

In redrafting the charges, the FSB set out to maximise the potential sentence. The charge of espionage has now been laid under Russia's new criminal code, which sets a maximum penalty of 20 instead of 15 years' imprisonment. The charge of treason has been brought under the old code, where again the penalty was higher. "Even a non-lawyer knows that an increase in liability does not have retrospective force," *Nezavisimaya Gazeta* commented on July 1. "Students in the law faculty get failed for such errors, but for the FSB investigators this is normal procedure." Nikitin was told on June 30 that investigations would continue for another three months, suggesting that the case might go to trial in the late autumn. When the court finally convenes, the prosecution is likely to present charges that are incompetently framed, that are very probably inadmissible under the Law on State Se-

crets, and that plainly violate the constitution. But that is not to say that the prosecution will lose.

In June 1996, on a petition from the FSB, the case was transferred from a civilian to a military court. According to Bellona, the FSB wants a military trial because the court would be closed, and because the security authorities would have more control over the conduct of the defence. Meanwhile Russian judges, military or civilian, do not have a distinguished record of denying the security authorities the verdicts they want.

It is no mystery as to why the admirals of the Northern Fleet, or the generals of the FSB, want Nikitin behind bars. But after a year and a half during which the persecution of Nikitin has alienated liberals at home and outraged environmentalists and human rights supporters abroad, one has to wonder why the Russian authorities allow the case to continue. Why does Yeltsin not simply order the charges dropped, recoup the support of a forgiving intelli-

gentsia, and reap foreign accolades and aid dollars for having struck a blow against authoritarian conservatives?

The reason is that Yeltsin, along with his new team of aggressive young reformers, feel that they can not get by without the FSB and everything it represents. During May the astronomical total of unpaid wages in Russia rose once again, with no one expecting a significant fall any time soon. Meanwhile, accusations continue to fly of the "reformers" delivering juicy chunks of freshly privatised oil company stock to friendly banks at derisory prices via rigged auctions. Called upon to declare their earnings, government ministers put down six-figure dollar sums to "book royalties" or "lecturing fees". A robber capitalist needs a machine of repression. And to be a credible menace, that machine must be allowed to show potential dissidents that they are not safe from it behind laws, human rights commitments, or even the constitution.

Ranfrey Clarke  
austgreeni@glas.ape.org

Source WISE Communique 476

## *Turbulent times for fusion power*

Although all early power reactors were expected to produce energy "too cheap to meter," fusion energy was the holy grail. Fusion power was supposed to imitate the sun with a tightly held plasma in which fusion reactions would be indefinitely sustained. The claims for fusion power were so great that to outsiders the reactors seemed like the perpetual motion machines of the physical world.

Well, fusion research has been perpetual money-eating machines. Assorted governments have built giant "tokamaks" —huge doughnut-shaped chambers in which powerful magnetic fields are supposed to force deuterium and tritium atoms into close quarters, with enough heat applied so that the atoms collide forcefully enough to fuse together.

Once the fusion reactions begin, the energy produced by those reactions is supposed to keep the plasma hot—a step described as ignition. After ignition is achieved, it's supposed to be just a matter of periodically adding tiny bits of fuel. The reactions should continue as long as the plasma is confined.

For a time, it seemed as if it might work. The tokamak at Princeton produced a measurable amount of power for a few seconds, but Congress has since turned out the lights. Measurable power was also produced at the European Community's tokamak at Chulbam, England, but a magnetic reaction caused the entire structure to jump by a half an inch.



No matter how large a reactor was built, however, researchers wanted a still larger one, as well as more powerful magnets to confine the plasma. If only, they said, they could build a *really big machine*, it would be sure to work.

When the price tag began to skyrocket for larger projects, the major powers began talking about pooling





their resources to build a single, no-expense-spared demonstration model. In 1988, the United States, the Soviet Union, Japan, and the European Community got together to develop preliminary plans for the "International Thermonuclear Experimental Reactor," or "ITER." By 1992—with Russia taking over the Soviet role—they settled down to work on design.

No expense would be spared in building the \$10 billion show stopper (the powerful magnets alone would cost billions). Sure, planners said, ITER might need 100 million watts to shove it into action, but once it goes, it was "99.5 percent" certain to generate a whopping 1.5 billion watts. As they moved to the final planning stage, they touted the reactor as a marvel of international co-operation and predicted it would lead to smaller, less expensive machines that would eventually power the world.

Then last year disconcerting whispers began to circulate in the physics community. Two researchers at the Institute for Fusion Studies at the University of Texas—William Dorland and Michael Kotschenreuther—began quietly talking to colleagues about their analysis of ITER'S design, and in particular about the problem of turbulence. (Wasn't it Richard Feynman who described the problem of turbulence as something about which even God's explanation was likely to fall short?) Finally, in November 1996, Dorland and Kotschenreuther demonstrated that turbulence at the plasma's periphery would be such a source of heat loss that ITER could not achieve ignition. The design, they said, "wouldn't work, and by a sustainable margin."

Previous calculations of how ITER would work had been based on projections from experiences with smaller tokamaks. Ironically, Dorland and Kotschenreuther were able to show

that ITER'S problems were not analogous—they would be a direct function of its mammoth size.

Dorland and Kotschenreuther received kudos from many in their field. For instance, Princeton physicist Ed Synakowski dubbed their model "essential" to understanding what is going on in a tokamak, and Steven Cowley of ULCA said that "for the first time, there is a physics-based transport model for tokamaks" (*Science*, December 6, 1996). But a lot of the folks at the Energy Department's office of fusion research were less delighted.

Scientists began to speculate on how ITER'S design might be altered to overcome the problem. And Weston Stacey, writing on behalf of the entire U.S. ITER Steering Committee, took care not to criticise Dorland and Kotschenreuther's results, complaining in a letter to *Science* only that the magazine had been wrong to suggest that the analysis would hurt rather than help the international project.

Still, the issue was serious enough that it had to be dealt with. In January, faced with both budget problems and powerful criticism of the ITER design, the Energy Department asked a team of fusion researchers to make a "sweeping review" of the ITER design. There were particular worries about funding. Even Richard Hazeltine, head of the Institute for Fusion Studies at the University of Texas, a long-time ITER sceptic, suggested a united front. Otherwise, he said, "there is the possibility that plasma physics could die."

Meanwhile, others reacted to the bad news about turbulence by piling on. The letters column of the March *Physics Today* was full of I-told-yousos that criticised the fusion project for its engineering problems. Letters from William Parkins, James Krumhansl, and Chauncey Starr all had the same theme: After 50 years of failure, it was

time to take a breather on a technology that had very little chance to ever working. And Krumhansl predicted that if the science were ever to be translated into a usable technology, it would be "a recipe for disaster" because "neither experienced design engineers nor cost estimators" had been adequately involved. According to Starr, fusion was a principle reason why "the public has become increasingly cynical about the intellectual integrity and reliability of the physics community."

But no one can outmanoeuvre fusion advocates, it seems. In April, the Energy Department issued the results of its review. According to the Fusion Energy Science Advisory Committee, ITER'S present design is just dandy, and there are no "insurmountable obstacles" to the reactor meeting its objectives.

Its revised objectives, that is. For after 50 years in pursuit of endless energy, the goal of ignition has been dropped. According to Martha Kerbs, the Energy Department's director of energy research, ITER is no longer about power generation (*Nature*, April 24, 1997). It is now about performing "an important set of science experiments." The next question, says Krebs, is whether Congress will agree.

—Linda Rothstein

### ***Originally Ice-Breakers Now Strike Breakers***

Regional authorities in Russia's Far East have proposed converting a nuclear ship belonging to the Pacific Fleet into a makeshift power station in an effort to ease the tremendous effects a major miners' strike is having on electricity production. Such a move supposedly would give rise to a whole fleet of small, floating power reactors designed to bring electricity to remote regions.

## *Too Costly to Continue Even in Belgium*

The most significant factors in the decision not to build new nuclear power plants in Belgium are the low price of natural gas and the high capital costs of nuclear, an official of architect/engineer Tractebel said.

Guy Frederick, general manager of Tractebel Energy Engineering, said that, while in the 1970s and 1980s the cost advantage of nuclear power was "evident," since the early 1990s "economics is now a new concern." In constant money, the cost of a nuclear reactor per kilowatt in the 1970s was "half of what it is today," Frederick said.

Under Belgian practice, the country's seven units are scheduled to be amortise 20 years after construction. However, it is expected that they will operate "long beyond the 30-years design lifetime we expected" when the reactors were ordered, he said. Examinations by utility Electrabel have shown that, "as long as maintenance is effectively organised, all components and systems can be serviced and the plant lifetime is theoretically unlimited."

Tractebel has calculated that, to prevent performance of an existing reactor from being profitable, a so-called "available cost" of 90 ECU/kilowatt/year must be exceeded by major backfires or interruptions. Calculations show that the last year safety inspection at the unit, cost Electrabel 55 ECU/K W/y. That action involved major fixes to internals and kept the plant off-line four months beyond the normal annual outage. A steam generator replacement at the plant, which kept the reactor off-line two months extra, cost 35 ECU/KW/y.

These measures represent the greatest interruptions to reactor operation in Belgium. "So it is hard to define the economic limit for operation of our reactor," Frederick said. While the economic argument is "far from clear," he said.

Frederick said that, for a new reactor project in Belgium—the country has postponed construction of an eighth power reactor after extensive study and parliamentary debate—the cost of nuclear fuel would be 20%, operation and maintenance (O&M) 20%, and capital cost 60%. For a competing combined-cycle plant fired by natural gas, the heaviest cost component is fuel (60%), followed by capital (25%) and O&M (15%). Figures for both projects assume the gas and nuclear plants operate for baseload generation at a capacity factor of 85% and price construction at a discount of 8.6%, the usual rate for Electrabel.

While nuclear utilities world-wide aim to slash O&M costs to keep their existing plants on line, the Belgian figures for new projects indicate that, even if nuclear O&M costs are in the future reduced by a third, "their effect on the economics of a nuclear plant project would be negligible," Frederick said. The same goes for attempts to reduce the costs of the nuclear fuel cycle.

For the competing gas-fired plant, the most significant factor is the price of gas. "If the price of gas remains stable for 20 years, gas will be out of reach and nuclear can't compete" in Belgium, Frederick said. However, Frederick noted that, historically, gas prices have been "hard to predict." Likewise, supply security is uncertain. "Some utility officials tell us that it is

unreasonable to keep increasing our dependence on combined-cycle plants in a situation where the imported fuel represents 60% of the total costs of a kilowatt-hour," he recounted.

For nuclear power, the cost of capital is the most important factor "We have little cause of rejoice," Frederick said, since, unlike most of the world's technologies, "over the last 20 years the absolute costs of construction have continually increased." There is a "lot of talk" about streamlining by advance licensing, serial manufacturing, and simplification of regulation, "but while these steps are positive, will they have a really beneficial effect leading to a turnaround in the general trend of cost escalation for nuclear construction?" Frederick asked.

Despite his pessimism, the Tractebel manager said there are possibilities for cost-cutting, including elimination of "monopolistic" market niches enjoyed by vendor firms in the complex process of building and licensing reactors.

Frederick also said that he hoped that deterministic regulations, which currently impose a "too severe burden," might be alleviated should Belgium build an eighth reactor. But he cautioned that, "before that happens, the onward march of gas will continue in Belgium," noting that Belgium is close to finishing the fifth combined-cycle plant built since the last reactor there was started up.

-Mark Hibbs,  
*NUCLEONICS WEEK* — May 15,  
1997



## Short Notes From Near and Far

### *The secret of Ratnahalli*

Mark Hibbs the legendary German correspondent of *Nucleonics Week* and *Nuclear Fuel* has done it again. Exploiting the Indian weakness for sounding off in front of white skinned foreigners, he has found out the till now well guarded secret of Ratnahalli. Ratnahalli is just six kilometres of Mysore city and ever since the construction of the Rare Materials Plant started a decade back, activists in Mysore have claimed that it was a uranium enrichment plant. Stout denials were all they ever got in reply. It should be noted that this is one of those nuclear facilities, whose existence has not been revealed officially to Pakistan as per the rules of the treaty for not attacking each others nuclear installations. The question, why was India interested in uranium enrichment when our "peaceful" nuclear programme did not use the stuff, always remained unanswered. However, in the December 2 issue of *Nucleonics Week*, Mark Hibbs reports that, "For the first time, to my recollection, the Indians said outright here that the plant near Mysore is meant to be used for making Highly Enriched Uranium for submarine fuel, enriched to between 30-45% U-235. BARC types categorically denied the technology is to be used for either development of a boosted device or for Low Enriched Uranium fuel for reactors." It seems that the chakkars of the Soviet leased submarine INS Chakra have not been enough for the ghanchakkars of New Delhi.

### *Guided Democracy Guides On*

One thing to be said about nucleocrats—nothing deters them from their chosen course. Certainly nothing as ephemeral as public opinion. Like King Bruce they believe in try, try try again. People from the area of Mala, in northern Sweden, have

rejected plans by the Swedish nuclear fuel and waste management company, SKB to further investigate the idea of building an underground repository for spent nuclear fuel in the region. Results from a referendum held Sunday showed 55% of residents opposed the plans. SKB expressed 'regret' on the outcome, but seemed optimistic that their efforts were gradually gaining favour with the public, citing that in 1995 a similar vote in the Storuman region resulted in a 71% vote against similar work.

### *Love Thy Enemy*

The US and Russia have agreed to end the production of weapons grade plutonium. Under the agreement, the US will assist Russia to the tune of US\$80 million, with the conversion of its three operating plutonium production plants to civilian power plants by the year 2000. Russia has also agreed not to restart 10 other such reactors, already off-line. The US has made similar promises, agreeing not to start its 14 plutonium production reactors, which have been off-line since 1989. (Reuters, 23 September)

Close on the heels of reports that only 2 US utilities have expressed interest in producing tritium for the Department of Energy's (DOE) maintenance of its nuclear weapons inventory, a senior Russian defence official has indicated that the Russian Federation would consider selling the US the tritium it needs. (*Nucleonics Week*, 25 September, 1997.)

### *The Mess They Left Behind*

As imperialist masters the British were bad enough but compared to the Russians they positively shine. The fraternal bear-hug of the Soviets has left an incredible trail of death and devastation.

Several Georgian soldiers are suffering from chronic radiation sickness and from fourth degree radiation burns. Some have developed large sores on their lower extremities due to exposure

to extreme radiation. Only after several soldiers complained about pain and strange wounds was it discovered that radioactive capsules filled with Cesium-137 had been left behind by Russian troops at a former Soviet military base. So far 17 capsules have been found. They appear to be scattered on the base as well as outside of it. Georgian hospitals are ill-equipped to give proper care, and soldiers are suspicious of promises of adequate treatment in Moscow.

### *Utilities Advertisement in the Wake of Three Mile Island*

(A found poem)

*we are committed to cantor Anil openness.*

*It may not be possible to answer all the questions.*

*Incident. Core material Meltdown.*

*This is time to avoid emotionalism.*

*Truth only gets obscured*

*and rational decisions are impeded*

*leak. Emission. Exposure.*

*There are lessons to be learned.*

*first constitution goes to public safety and health.*

*look At our record.*

*For radiation consider*

*X-RAYS, microwaves, the sun.*

*This is matter of risk assessment.*

*No available energy source is risk-free.*

*The question of human error must be death with.*

*It may not be possible.*

*we are committed.*

## DRACULA ON THE PROWL A GAIN

### *Rajasthan reactors on way to full-scale recovery*

*The following article which appeared in The Hindu of 2nd December is just a sample of the recent publicity blitz regarding the recovery of the Rajasthan reactors launched by the nuclear establishment. The achievement of replacing pressure tubes is being touted as a great triumph of Indian technology. It »\$ nothing of the kind. The Canadians had already done this more than a decade ago but that did not help their reactors last longer and they had to mothball seven of the same CANDU type reactors in one shot. Unfortunately this kind of hype is very common with the nuclear establishment and it gives a bad name to Indian scientists in general and devalues even genuine achievements.*

The second unit of the Rajasthan Atomic Power Station (RAPS-II), which is set to create history as a symbol of Indian resistance to a strict embargo regime dictated by the West, will resume power generation by March 1998.

Almost given up for dead three years back, the unit, along with its neighbour RAPS-I, is on its way to a full-scale recovery. More than 250 out of the 306 coolant channels of the reactor have been replaced by a fine-tuned RAPS team. The rest of the job would be completed before the end of the month.

Once the present exercise is over, the unit has to undergo all the procedures that are mandatory for the commissioning of a new reactor. Refueling will be followed by a series of tests. Then, each system of the plant would be run separately, followed by the start-up of the reactor.

Speaking to The Hindu near the core of the reactor where he was supervising the replacement operations, the Project Director, Mr. V. K. Chaturvedi, said safety upgradation and installation of additional infrastructure were also being undertaken simultaneously. As per the direction of the Atomic Energy Regulation Board (AERB), the country's watchdog of nuclear safety, a high pressure heavy-water injection system had been installed. In the event of any emergency related to the cooling system, 50 tonnes of heavy water would be pumped in instantly.

*The above paragraph contains not one but two errors. If the interview was actually conducted near the core of the reactor both these guys would have got burnt to a crisp in a short time. The high pressure heavy water injection system is meant for pumping out heavy water during emergencies not pumping it in.*

Other additions included a supplementary control room, an additional on-site diesel generator to power the essential services in the event of floods (the reactor is situated near the Ranaprathap Sagar dam on Chambal river), segregation of power supply lines and instrumentation panels. "The reactor can now run for 30 more years," said Mr. Chaturvedi, who was deputed by the Nuclear Power Corporation (NPC), which runs all the nuclear power reactors in the country, exclusively for the revival and rehabilitation of the plant. The reactor would now run to its capacity of 200 MW.

Besides reviving a defunct reactor along with the economy of the entire Rawatbhatta region, the extremely delicate job of coolant channel replacement, which is happening only for the second time in the world, has also armed the country with a proprietary technology that could be marketed in the Pressurised Heavy Water Reactor (PHWR) services sector abroad. Pakistan, Argentina and South Korea have reactors of this category and would need replacement of coolant channels at some point of time.

The resurrection of the reactor is a show of indigenous strength in the entire spectrum of nuclear technology when Canada which supplied the unit, refused to help and dubbed the reactor unsafe in international forums. But against all odds, the "Coolant Channel Replacement Group (CCRG)". constituted by the NPC three years back, found a solution which cost only a fraction of what Canada spent for a similar reactor.

While the Canadian technology would have cost Rs. 4 crores per channel. Indians could wind up the entire replacement procedure for the same amount, Mr Chaturvedi said. It was an operation which was 306 times less expensive, that too at a much lesser level of exposure to radiation. The end-fittings and the new coolant channels cost more than Rs. 80 crores

The total cost of the revival is estimated at Rs. 252.54 crores with Rs 53.6 crores earmarked for safety upgradation and rehabilitation.

The project was ahead of schedule by about six months. This would help reduce the cost by about Rs.20-25 crores. This saving would be made in the Interest During Construction (IDC) component which totals to Rs 45.31 crores. About Rs. 10 crores was saved in indirect costs too.

The problem was first noticed in the 1980s when Canada reported that the Zircalloy pressure tubes of a simi-





lar reactor at Pickering had developed cracks. This led to investigations at RAPS-II which revealed that the garter springs separating the coolant tubes and the calandria tubes had moved and the former was touching the latter. This resulted in the formation of hydrides at the point of contact because of the inherent characteristics of Zr-alloy and the temperature difference between the pressure tube and that of calandria. The Canadian experience also indicated that hydride formation could lead to cracks and leak.

The new channels are made of Zr-Neobium, an alloy stated to be more stable in a radioactive environment.

The reactor was shut down in September, 1994 and after extensive studies, in October, 1995 it was decided to take out the fuel. By January 1996, defuelling was completed which was followed by decontamination.

From January to April 1996 workers were trained on life-size mock-up. The removal of channels were completed in four and half months, much ahead of its schedule.

Besides enriched uranium, the core would use 18 bundles of thorium oxide which would help the reactor achieve maximum power. In fact, thorium as fuel represents the third phase of India's nuclear programme whereas enriched uranium belongs to the first phase.

In a country-wide perspective, the achievement at RAPS breathes fresh life into the country's nuclear power programme which has been hit by paucity of funds. Five more reactors, which used Zr-alloy tubes, would face the same situation at some time or the other. The CCRG will now be a near-permanent task force of the NPC.

G. Pramod Kumar. *The Hindu*  
December 2, 1997

*Editor's Note: Rawatbhata Nuclear Power Station has been operating, or rather usually not operating at the site for the last 25 years. It is somewhat late in the day for the authorities to wake up to the fact that it is situated on the banks of a river and diesel generator is needed in case of floods. There was a fire in the turbine building in 1985 and the report on the fire had specifically mentioned that power lines need to be segregated for safe operation of the plant. The fact that the authorities took as much as twelve years to do this and continued to run the plant in an unsafe manner is an indication of their callousness with regard to safety.*

## ***Stupidity is Contagious***

### ***Bangladesh decides to have a nuclear power plant***

In a recent article dated October 17, 1997, the *Daily Star* reported that the Government of Bangladesh had decided to implement the Rooppur Nuclear Power Plant Project. The decision was reportedly taken at a meeting of the Rooppur Nuclear Power Project Implementation Committee with the Prime Minister in the chair and the Finance Minister, Energy Minister, Education Minister, Planning Minister and the Atomic Energy Commission Chairman in attendance. It was observed in the meeting that the "environment-friendly" nuclear power project would meet the country's electricity demands, particularly those of the northern region at tower costs. The Prime Minister directed the committee to speedily implement the project.

#### *The Same Lies*

In a report in the same daily last year, the Bangladesh Atomic Energy Commission (BAEC) engineers and scientist had pointed out that nuclear technology is considered one of the "safest" power generation systems. BAEC engineers had also indicated that the annual fuel cost of a nuclear power plant was much lower than that of a conventional gas-burned plant. Therefore, according to them, the proposed nuclear plant would be part of an optimum mix of electricity generating plants for Bangladesh.

The concept of the Rooppur project was developed in 1961 and was approved for 70 Megawatt (M W) of electricity generation. The plant site is in the Pabna district, about 180

kilometers from Dhaka. The current plan is to have a much larger plant of 400 to 600 MW capacity, which is estimated to cost about \$1 billion.

To the unsuspecting general public, only this kind patently false statements regarding attractive cost-efficiency, safety and environment-friendly aspects of the nuclear power plant are presented.

#### *Cost-Effectiveness*

A BAEC scientist was quoted in last year's *Daily Star* report as saying that "although the initial cost of a nuclear plant is double that of a conventional gas-burned plant, the fuel cost is much lower than that of a coal or oil-burned plant". He further asserted that a typical 300 MW plant would cost about



\$600 million. However, this assertion is not correct since the presently quoted prices for a nuclear power plant are well over \$3000 for a kilowatt. Data from constructed nuclear plants show that tremendous cost overruns regularly occur due to unforeseen problems involving safety concerns, faulty construction, etc. The Diablo Canyon Nuclear Power Plant in the USA comes to mind as an example of such cost overruns. This two-reactor plant, designed to generate 1100 MW per reactor, was planned in the early seventies and was estimated to cost around \$500 million. About 90% of the construction was completed in 1976 within budget when a new earthquake fault was discovered near the plant. Seismologists estimated that this fault was capable of producing a much larger earthquake than the one the plant was designed to withstand. The plant completion was delayed for five years and the cost tripled to \$1.5 billion. In 1981, the plant was ready to start operations, when the final inspection uncovered numerous errors in design and construction process, improper quality control, inadequate documentation, etc. Another five years were required to identify and correct all these errors. The final cost ballooned to about \$8 billion before the plant started producing electricity ten years behind schedule. The level of anxiety, this induced in the people, unfortunate enough to be living close to the plant, could well be imagined. The experience of Indian nuclear power plants is illustrative which have usually cost three times their original estimate.

### *Safety Issues*

The problems of safety of nuclear power plants are all too familiar to *Anumukti* readers and will not be elaborated out here. Suffice it is to say that Bangladeshi nuclear technicians have no experience at all of a plant of this size. All they have been familiar with is running a small 3M W research reactor at Savar. It should be emphasized that a 400 to 600 MW commer-

cial power plant has technical and safety aspects which are not generally encountered in a small research reactor. It may be accurate to surmise that the experience of the BAEC personnel, would not be adequate enough to supervise the construction and installation of the Rooppur plant. In fact the *Daily Star* article quoted the BAEC chairman as saying that the International Atomic Energy Commission was willing to provide consultants to ensure safety in the installation and operation of the plant. It seems that BAEC will largely depend on foreign consultants to ensure safety of the plant as well as design and supply of plant parts and equipment. Such dependence on foreign experts has not always proven beneficial to third world countries.

### *Need for Transparency and Accountability*

In addition to this, transparency and accountability is always a problem in projects involving nuclear materials. It is always easy to hide behind "national security" and "sensitive information" to withhold information from the public. There are numerous examples of evasive actions and cover-ups by commercial nuclear plant authorities regarding the extent of malfunctions, accidents and consequent release of radioactive material. A news item published in the *Daily Star* on October 27, 1997 illustrates the point. The news item states: "Immediately after the explosion in Magurchara, BAEC scientist were deployed at the site to detect any leakage of radioactivity but found none. The matter was never officially made public and all concerned remained tight lipped". We are told that all the 16 missing radioactive isotopes "miraculously" escaped leakage. We cannot, however, depend on such "miracles" to happen too often.

### *Only informed citizens can protect their rights*

In conclusion, it may be pointed out that most citizens of Bangladesh—not to mention a large population living in India—live within a 200-mile radius of the proposed Rooppur nuclear power plant. The disastrous effects of such proximal living to a nuclear plant are amply demonstrated in the case of those people living near Chernobyl. Any accident in the Rooppur power plant has the potential to adversely impact the lives of every citizen of Bangladesh and of future generations. All this for producing 400-600 MW of electricity when there exists a high potential of discovering large gas fields in the near future. Thus the setting up of this power plant should not be at all considered without putting these issues in perspective and without serious public debate. It is imperative that, as a minimum, the following steps should be taken by BAEC and the government of Bangladesh before any further pursuit of this project:

- I. Organize public seminars where BAEC scientist and engineers will present their estimates of possible safety hazards and what steps will be taken to minimize them
2. Have public hearings in communities near the plant regarding the probability of accidents occurring during the lifetime of the plant to determine the level of risk acceptable to the population and whether it is at all willing to take such risks.

It is, therefore, incumbent upon the scientific community of Bangladesh to come forward and initiate discussions to inform the public about the issues involved. Otherwise, we may step into a possible nuclear nightmare, reminiscent of Chernobyl, with far worse consequences for the population.

*Dr. Ahmad Fazlul Kabir*  
engineering consultant involved in  
evaluating structural safety of  
nuclear plants



## ■ LETTERBOX

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*Continued from page 2*

lead to a major accident. Control rods have failed to insert properly a number of times at VVER1000 plants. Problems with control - rod insertion have also cropped up recently at French plants, leading to the costly replacement of the whole control • rod drive mechanism at many plants.

- Problems with tubing at steam - generators. This can lead to leakage of radioactive primary coolant from the pressurised primary circuit of the reactor into the secondary circuit. If the leakage is large, it can lead to a loss of coolant accident as well as damaging other parts of the plant.

Because of the design and layout of the plant, there is a part of the plant where main steam lines cross each other, directly adjacent to emergency feed water injection lines. In earlier models of VVER, there was also safety - related electrical equipment on the floor underneath. If a main steam-line were to break for some reason (for example, it would be quite likely to do so if it had water in it from the primary system because of a steam - generator problem. It could also do so because of an earthquake), it would then whip about like a monster headless snake, destroying everything in its path including emergency feedwater piping etc.

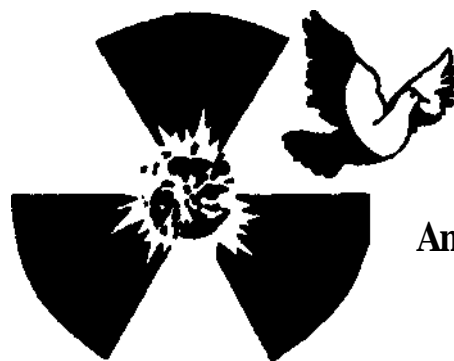
There are also a whole series of problems with the instrumentation of control systems of VVER plants, and Siemens and Framatome are engaged

in replacing most of the I&C systems of every VVER in Europe and European Russia.

I do not wish to say by this that some other brand of nuclear plant would be any better. I don't want to persuade you that for example, if you bought a plant from, say, Westinghouse or Framatome or Siemens or Mitsubishi that you would then be safe. The problems that show up in VVER 1000 plants show up in various ways in other plants too.

But safety problems with VVER1000 plants are now certainly well documented, and searching questions need to be asked about this Koodankulam project now. The answers to these detailed safety questions are often costly, but not near as costly as not asking them is going to be.

*John Hallam,  
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